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Impact of Food Rescue Nutrition

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Impact of Food Rescue Nutrition

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" مشيناها خُطىً كُ تِ بت ٤ ا ي نا

ومن كتبت عليه خُطىً .. ه شاها "

٤ بدا ا عزي ز ا ا حري ني

“Life is either a daring challenge or nothing”

Helen Keller

Dedication

To Austin, the most enchanting city in the Universe!

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Impact of Food Rescue Nutrition

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Food insecurity affects 13.4% of Americans, although 30-40% of food is deposited in landfills. Food rescue nutrition is the process of redistribution of surplus food to the low-income. This research consists of four studies. In study 1 and 2, the extent of involvement and motivations of organizations and volunteers in food rescue nutrition were documented. In study 1, food rescue nutrition survey was developed, validated and tested to obtain information from 100 organizations in eight Southwestern states. The organizations donated an average of 2 million kg of food/month to 41,734 clients. These agencies were dependent on an average of eight workers and 3,081 volunteers. Challenges reported were the reduction of food portions and turning away clients due to lack of resources. In study 2, the Motivations to Volunteer Scale was created to measure motivations to volunteer in food rescue nutrition, and validated in 40 adults, then tested in 300 individuals. This newly developed scale was documented to be a valid tool (mean score = 9.15 ± 0.17), and consisted of four factors: requirement, career improvement, social life and altruism.

Study 3 assessed the impact of food donations on diet quality and nutritional status of 222 clients of a soup kitchen and food pantry. Participants completed a demographic questionnaire, food frequency questionnaire and list of food donations. The food pantry donations supplemented the total diet with ≥ 50% of the client's daily needs of energy, macronutrients, vitamins B_6 and B_{12}, phosphorus, copper and selenium. The total diet of these clients also met the 2015 United States Dietary Guidelines for refined grains, fruits, vegetables and meat, but not for whole grains and dairy foods. Study 4 was similar to study 3, but included clients of a soup kitchen. Dietary intake of these participants was much poorer than those of the food pantry, and 95% were homeless. The soup kitchen meal lacked vegetables and meat; nonetheless, it improved total diet quality by 10%.

Thus, organizations and volunteers were highly involved in food rescue nutrition. Furthermore, food donations from the food pantry and soup kitchen improved nutritional status and diet quality of the clients.

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CHAPTER 1. INTRODUCTION AND REVIEW OF LITERATURE

In 2015, more than one third of all food in the United States (U.S.) was reported to be deposited in a landfill [1]. This amount of food waste is of concern, as 15% of Americans are low-income [2], and 13% are food insecure [3]. Food insecurity is defined as a socio-economic inability to buy uncontaminated, healthy food in adequate amounts [4]. In response to this problem, the field of food rescue nutrition was established. Food rescue nutrition is the process of collection, transfer and donation of surplus or unwanted food to the impoverished. This dissertation describes a community-based approach to document the role of organizations and volunteers in food rescue nutrition, as well as the effect of this approach on nutritional status and diet quality for a low-income population in Texas.

Food loss and Food Waste: Food loss or waste is the proportion of food that can be eaten by humans, but has been lost throughout any stage of the food supply chain [5]. Food may be discarded for several reasons, including consumption by pests or rodents [5], overproduction, mislabeling, improper storage or packaging [6,7] or disposal of unwanted but edible food. In 2014, the amount of food loss in the U.S. was estimated to be 133 billion pounds. This consisted of 19.1% dairy products, 19% vegetables, 14% grain products, 13.9% fruits, 12.6% discretionary foods and sweeteners, 11.5% meat, poultry and fish, 7.5% added fats and oils, and 2.1% eggs [8]. Food waste, which is the portion of food that is discarded [9], costs the American economy $ 1.3 billion/year [8]. To reduce food

loss, unused food can be donated to those in need. Thus, surplus food is a food item that is available for purchase or bought by individuals, but not sold or consumed because of unknown reasons [6].

Food waste/loss and recovery has been investigated in numerous other countries. In 2013, the European Union reported that food waste was 393.8 lb per person [10]. Other reports are available for Canada[11], Australia[12], Italy [9,13-15], Spain[16], Belgium[5], Denmark[17], Switzerland[18], Austria[7,19], Japan, Southeast Asia[20], and Poland[6]. Collectively, these studies reported that billion pounds of food are discarded every year. Methods by which this amount this amount of waste can be reduced is the redistribution of surplus food to those need, or reuse of this food as animal feed. This dissertation will focus solely on the redistribution of food.

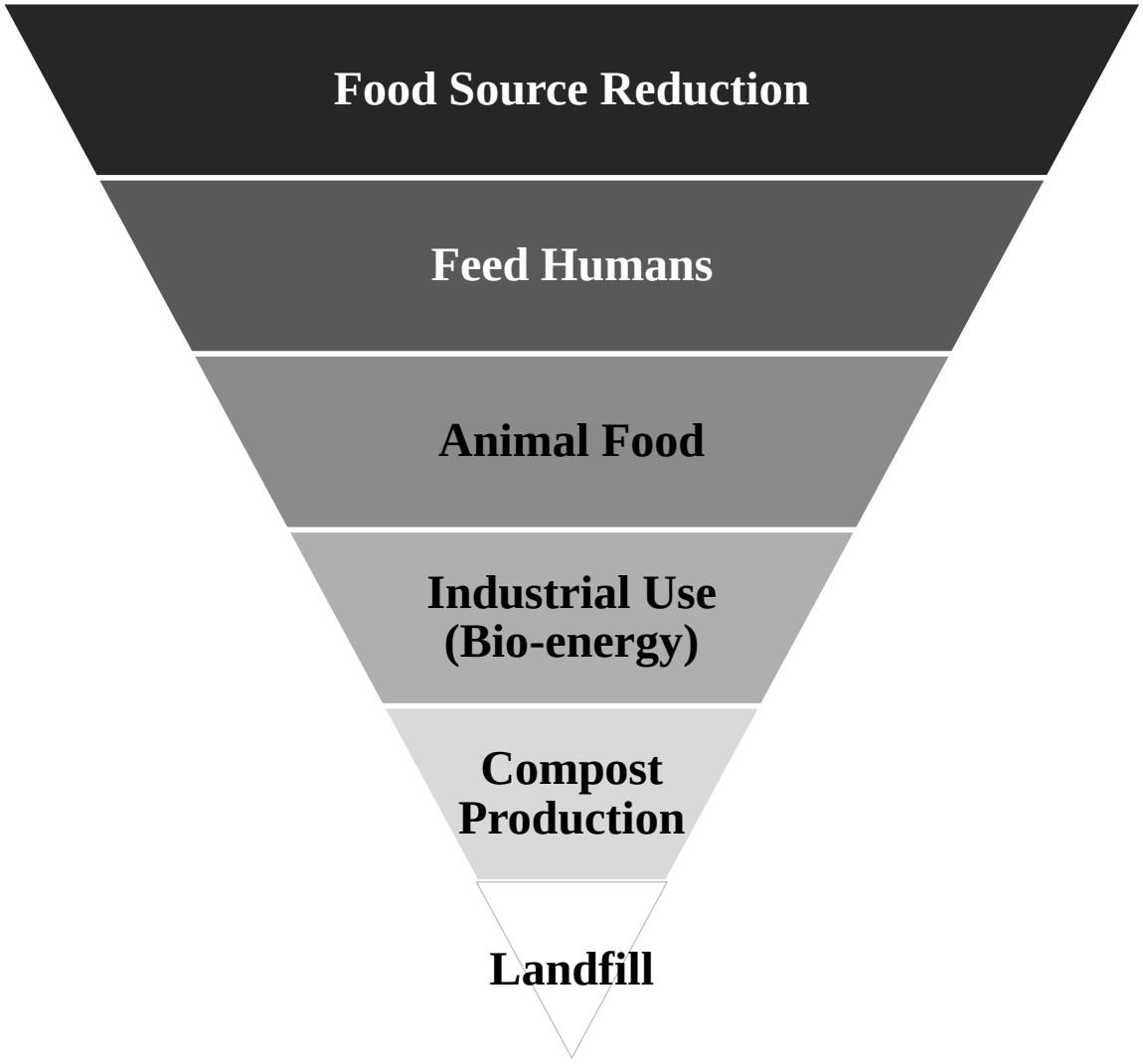
At the individual level, food waste/loss can be minimized by defining the quantity of food needed and then cooking meals based on household size, or checking the expiration date of food products [21]. At the national level, the U. S. Department of Agriculture (USDA) proposed the food recovery hierarchy (**Figure 1.1**) [22]. The hierarchy includes: control of food production, donation of excess food, and recycling unwanted food and food waste to generate animal food, energy, and fertilizers [22,23]. The current research will explore how the donation of excess food affects nutritional status of its clients.

Food Rescue Nutrition: A number of food assistance programs reduce food insecurity in the U.S. These include the Supplemental Nutrition Assistance Program (SNAP; formerly

Food Stamps), the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), School Breakfast Lunch Programs, Child and Adult Care Food Program (CACFP), Elderly Nutrition Program, Meals on Wheels, and the Emergency Food Assistance Program (TEFAP) [24]. The impact of these programs can be substantial in improving food security. For example, Mabli and Worthington (2014) [25] conducted a 6-month study and found that food insecurity in 3000 low-income households who received SNAP benefits decreased from 37.2% to 24.7%. This figure is lower than the incidence reported by Dhokarh et al. [26] these investigators reported that 81% and 82% of 154 low-income women who received food benefits from WIC and SNAP lacked food security, respectively.

Nonetheless, 20%, 16%, 13% and 6% of 1,500 low-income households in Virginia reported loss of employment, and assistance from SNAP, Medicaid/Health insurance and Temporary Assistance for Needy Families, respectively [27]. Thus, it appears that food insecurity in the low-income population is quite prevalent, and that governmental benefits do not completely alleviate this situation. Other non-governmental organizations that provide support to the food insecure include food banks, community agencies or churches such as food pantries and soup kitchens, which in turn donate these free food benefits to the low-income.

Figure 1.1. The Food Recovery Hierarchy [19] was developed by the U.S. Department of Agriculture as a food waste management strategy. Note the second level, food donation as an important resource to reduce landfill waste



At present, a detailed description and/or documentation of the contribution of organizations involved with food rescue nutrition in the Southwestern states of the U.S. are scarce. Thus, **Aim 1 is to document the extent of involvement of organizations in food rescue nutrition in the Southwestern United States.**

Samaritans and Volunteerism: In recent years, a large number of community activists have responded to issues of food insecurity by initiation of charitable networks that redistribute unconsumed food. These food assistance organizations are distributed throughout the world including the U.S. [28,29], Canada [30,31], Australia [32], the United Kingdom [33], Netherlands 31, Finland [35] and Korea [36].

In the U.S., the number of nonprofit agencies involved in health, education and art registered with the Internal Revenue Service in 2015 was 1.41 million. Collectively, these organizations increased the gross domestic product of the U.S. by 5.4% (~ $906 billion). Approximately 36% of these nonprofit agencies were involved in food redistribution [37]. Among the largest of these charitable networks are Feeding America and Community Harvest [38]. Feeding America is the biggest non-profit national program that was created to fight hunger. This program is estimated to provide about 4 billion meals annually, feeding more than 48 million individuals [39]. In Texas, Feeding America has 16 networks, including the Capital Area Food Bank of Texas. These agencies provide an approximate annual amount of 337 million pounds of food for low-income Texans [39]. The Community Harvest of Stark County, Ohio was established in 1989 as another community activism project. Workers of food outlets collect unsold food and give it to community activists

who then donate this food to the homeless [37]. The goal is to provide nutritional support to low-income and food insecure individuals [41]. These two agencies have shown that the redirection of surplus food is an inexpensive approach to increasing food availability to the impoverished in the U.S. [39]. But why individuals participate in these charitable organizations is unclear.

Volunteers are essential for agencies involved in the food redistribution networks. Yet the motives for participation in this field have not been studied. Motivations are hypothetical constructs that describe the reasons for actions and behaviors of individuals, and explain why and how one acts, and responds to issues [43]. Volunteerism is associated with behaviors such as religiosity, positive life outcomes, mental wellbeing and a desire to broaden one's social networks [44]. For instance, 211 African-American women, aged 16-83 years, were involved in community agencies in the American Northeast, primarily because of religious purposes. This type of volunteerism was more prevalent in women younger than 24 years than in those older than age 40 (~ 48% vs. ~ 22%). However, older women volunteered more frequently [45]. The Social Capital Community Benchmark Survey recruited 29,200 participants from 41 communities. This survey reported that engagement in altruistic activities by the volunteers was stimulated by happiness, presumably due to compassion and pro-socialism [46].

Specific motivations for participation in food rescue nutrition are not understood. One contributing factor might be the impulse to gain a feeling of solidarity that is formed due to feeling responsible towards developing and/or improving their community through

helping others. Other possible reasons might be being a member of a service community group such as a church, and/or forcibly doing a community service that is assigned by a probation officer or school/college curriculum [47,48]. To date **t**he literature lacks documentation regarding motivations of participants and their role in food redistribution. Thus, **Aim 2 is to document the extent of participation and motivations of volunteers who are involved specifically in food rescue nutrition.**

Food availability and nutrition status: Factors that may affect food availability in low-income populations include socio-economical status [49], food choices and preferences, nutrition awareness [50], dietary behaviors [51], food environment [52] (food prices and availability) [53], and neighborhood accessibility to transit modes and grocery stores [54]. For instance, limited resources coupled with living in "food deserts" (communities that do not have sufficient number of grocery stores, supermarkets and food outlets), could reduce the ability of individuals to be able to purchase and consume healthy foods [54].

Economical status includes the income, occupation, and receipt of government financial aid and/or food benefits. These benefits can positively influence food purchases and improve food security, yet not all individuals receive governmental assistance. For instance, a national survey showed that only one third of 494 low income, food insecure adolescents were receiving financial aid from the government. Consequently, the remaining two-thirds who were not receiving benefits were at increased risk of becoming food insecure [55].

Poor food choices may contribute to food insecurity in the low-income. These might be due to both desire and/or a lack of education. Dammann et al. [53] showed that the majority of 448 low-income adult women spent more money buying less healthy foods (non-whole grains, processed meats, fruit drinks and soda, frozen entrees, condiments and salad dressings, salty and sweet snacks) than foods perceived as more critical to nutritional adequacy (fruits, vegetables, legumes, low-fat dairy products and lean meats). Why these behaviors occurred is unknown. It is believed that a limited ability to purchase relatively expensive foods of high nutritional value may contribute to consumption of poor diets in low income populations. The current research examined the role of food donations in influencing the nutritional status of recipients of food rescue nutrition.

A study by this laboratory documented that the lack of availability of fruits and vegetables in 115 homes of low-income mothers was positively associated with buying and consuming convenience foods [57]. Thus, an inability to purchase healthy foods or poor food choices could negatively impact nutritional status. For example a 3-month longitudinal study of SNAP recipients found that low food security adversely affected diet quality [51]. The low-income clients reported a daily consumption of 0.9 servings of fruits, 1.2 servings of vegetables, and 0.6 serving of whole grains, as opposed to the recommended 4, 5, and 5 servings, respectively. These patterns of low quantities of healthy foods correlated with a lack of the recommended nutrient intakes for dietary fiber, potassium, iron and folic acid [51]. This suggests that limited resources may adversely affect the nutritional status of the low-income.

A national survey investigated dietary intake in 10,165 low-income adults participating in the 1988-1994 National Health and Nutrition Examination Survey (NHANES) [58]. The average monthly frequency of consumption of fruits (38 times), vegetables (73 times) and dairy products (48 times) was low. This is due to that the monthly intake corresponds to eating 1.3, 2.4 and 1.6 servings per day of fruits, vegetables and dairy foods, respectively [58]. Additionally, a stratified sample from Delta Nutrition Intervention Research Initiative also explored dietary patterns in 1,607 American households who received food assistance, in which 22.1% were low-income (< $30,000) [59]. The mean healthy eating index (HEI) of the low-income individuals was modest (HEI-2005 = 57.4). Compared with the high-income participants, the low-income had low mean scores for dairy foods (4.2 vs. 3.2), vegetables (5.6 vs. 4.4), cholesterol (7.4 vs. 6.8) and lack of intake of sodium (Na) (7.1 vs. 6.3) ($P < 0.05$) [59]. Moreover, larger proportions of the high-income adults met the U.S. Dietary Guidelines than did the low-income participants for carbohydrates (91.4% vs. 84.2%), proteins (70.3% vs. 61.3%), vitamin A (33.4% vs. 20.1% vs.), vitamin B_2 (78.5% vs. 71.6%), folate (40.3% vs. 32.9%), and vitamin B_{12} (71.9% vs. 64.3%), calcium (Ca) (17.2% vs. 11.3%), phosphorus (P) (83.1% vs. 73.9%), iron (Fe) (84.8% vs. 76.5%), copper (Cu) (72.4% vs. 61.2% vs.), selenium (Se) (88.2% vs. 80.6%), and zinc (Zn) (59.2% vs. 47.7%), respectively [59].

One way to reduce food insecurity is through the use of food donations. In 2011, Jessri et al. [60] analyzed the dietary content provided by food bags of a food bank of the

University of Alberta, Canada. The baskets provided substantial amounts of nutrients for each client. These food bags provided daily amounts of 3,251 kcal, 576 g carbohydrate, 157 g protein, 39 g fat, 61 g dietary fiber, 626 µg folate, 149 mg vitamin C, 802 µg vitamin A, 1,678 mg Ca, 40 mg Fe, and 9 mg Zn. In addition, the food bags consisted of 14.5, 7.6, 3.8 and 3.1 servings of grains, fruits and vegetables, meat products, milk and dairy. For each food recipient, the amounts in the food bag alone met the Canadian dietary guidelines for all food groups and nutrients except for Zn, and exceeded the recommendations for grains [60]. Thus, food bags have a significant positive effect on nutritional status of the clients, but the amount that it contributes to the daily diet is unknown. Therefore, **Aim 3 is to assess the impact of food donations on total nutritional status of recipients of a food pantry.**

Food availability: Limited financial resources and unavailability of food preparation supplies, coupled with an abundance of convenience and/or fast food outlets in the neighborhood, are features that adversely affect diet quality of low-income individuals. In a study by Nackers et al. 58, lack of sufficient income and food preparation supplies to cook healthy homemade meals significantly increased the risk of food insecurity by one-fold ($P < 0.05$). Limited financial resources and lack of cooking appliances were associated with consumption of foods of poor nutritional value (such as fast and convenience foods). A study by Dammann and Smith [52] reported that 92 low-income women did not have enough resources to purchase fresh produce (fruits and vegetables). Thus, these women were not able to prepare healthy meals for their families. Similarly, a

study by Morrissey et al. [49] showed that the high cost of fruits and/or vegetables restricted the ability of the low-income to purchase these foods. Thus limited resources of low-income populations have adverse effects on their diet quality.

In the U.S., Acheampong et al. [59] investigated food intake of 272 low-income Hispanic mothers receiving benefits from SNAP and WIC. These women had very low dietary levels of fruits (1.2 serving), vegetables (0.5 serving) and grains (3.2 servings). In Canada, Kirkpatrick and Tarasuk [63] examined nutritional status in 35,107 low-income families. Food consumption was based on a 24-hour dietary recall that was measured on two occasions, via an interview and phone. Participants met the daily recommendations [64] for fruits and vegetables (~ 5 servings), grains (5 servings), and meat products (4 servings). The exception was for dairy foods (1.4 servings) which was lower than the recommended (2 portions) [63]. Another study conducted in Canada found that the meal offered by a soup kitchen supported the homeless with 2.6 servings of grain products, 4.1 servings of fruits and vegetables, 0.4 serving of milk and dairy, and 1.7 servings of meat. The food also contained 1,136 kcal, 48 g protein, 10 g dietary fiber, 411 µg vitamin A, 99 mg vitamin C, 266 µg folate, 1 mg thiamin, 1 mg riboflavin, 22 mg niacin, 1 mg vitamin B_6, 3 µg vitamin B_{12}, 158 mg magnesium (Mg), 8 mg Fe, 667 mg P, 7 mg Zn and 360 mg Ca [65]. Yet one meal alone is not expected to fulfill the recommended daily nutrient needs[66].

In 2015, Nguyen et al. [67] explored the 2003 - 2010 NHANES for diet quality in 8,333 low-income men and women receiving SNAP benefits. This sample exhibited a

low diet quality, as indicated by a HEI 2010 score of 45.5 (P = 0.001). Similarly, Duffy et al. [38] reported that 65% of 55 low-income women obtaining food donations from a food pantry had a diet of poor nutrition value (HEI) score ≤ 50). All of the above studies measured the foods or nutrients of the donated foods or meals, but none have measured the impact of the donation on the total dietary intake in users of food assistance programs. Thus, **Aim 4 is to assess the impact of a meal donation on total diet quality of the clients**.

The first goal of the current project is to understand the extent and motivations of individuals and organizations involved in food rescue nutrition in the Southwestern states. The second goal is to determine the influence of food rescue nutrition on nutritional status and diet quality in a low-income population that receives donated foods and/or meals. It is believed that food redistribution to people in need is an important, low-cost approach that improves nutritional status of low-income populations in the U.S.

Hypothesis: Food rescue nutrition, the process of redistribution of food to those in need, will improve the nutritional status of its recipients. This research will be the first to document the types and benefits of organizations that participate in this process and also the motivations of those that volunteered in food rescue nutrition. Then, the effect of food and meal donations on nutritional status will be explored. Results of this investigation will provide baseline data to conduct similar studies at the national level.

CHAPTER 2. ORGANIZATIONS OF REDISTRIBUTION AND RESCUE

Abstract

Objective: Food insecurity affects 13.4% of the U.S. population, despite the fact that 30-40% of all food is deposited in a landfill. Food rescue nutrition is the process of redistribution of surplus food to the impoverished. The aim of this study is to document the extent of involvement of organizations in food rescue nutrition.

Design: In this cross-sectional study, a survey about organizations involved in food rescue nutrition was developed, validated and then tested in 100 organizations from eight Southwestern States.

Results: These organizations provided an average of 2 million kg of food to more than 40,000 clients each month. Food assistance programs had an average of eight workers and 3,081 volunteers. In addition to food, these organizations provided other services such as clothing, clinical and child care. The agencies encountered several challenges, including lack of resources that resulted in reducing food portions and turning away clients.

Conclusions: The extent of involvement of community-based programs in food rescue nutrition was strong in eight Southwestern states in the U.S. Organizations involved in food redistribution helped alleviate food insecurity in their clients. Sustainability of these charitable networks was dependent on availability of resources and sufficient volunteers.

Health professionals should encourage these organizations by providing support through donations of time, money and/or food.

Introduction

In the U.S., 133 billion pounds of all food is deposited in a landfill annually 1 8. This amount of food waste is remarkable; particularly since 13.4% of the population has been reported to lack food security [65]. Food insecurity is a socio-economic inability to obtain or purchase uncontaminated, nutritionally healthy food in sufficient amounts [4]. One solution for this problem is the donation and redistribution of unwanted or unsold food to low-income populations. In this process, surplus foods are redirected to food banks or charitable and faith-based agencies that provide assistance to those in need. These organizations include agencies, churches, shelters, orphanages, and safe places that offer help for the poor, disabled and/or victims of sex and domestic violence [41]. This process of food reallocation to those in need is called food rescue nutrition, the basis of the present research.

In the past, donation of foods was limited because of the potential liability of adverse health consequences from poor food sanitation. However, the Good Faith Donor Act of 1985 was amended in 1989 to protect individuals from being pursued in courts from illness due to food donations [69]. In 1996, the Bill Emerson Good Samaritan Food Donation Act removed this liability for business as well [41]. It was realized that it is better

to donate unwanted food rather than throw it away when people scavenge dumpsters to find food or beg on the streets. At present, the redistribution of unwanted food to give to others to improve their diets and food security is a major phenomenon in the U.S.

A large number of organizations and individuals participate in diverse aspects of food rescue nutrition to offer benefits to millions of clients each year. More than 200 large food banks have been estimated to exist nationwide. These include Second Harvest Food bank of Santa Clara and San Mateo Counties in California, Cleveland Food bank in Ohio, St. Mary's Food Bank Alliance in Arizona, East Teas Food Bank in Texas, Mid-Ohio Food Bank, Blue Ridge Area Food Bank in Virginia, Food Bank for New York City, Second Harvest Food bank of Orange County in California, Inter-Faith Food Shuttle in North Carolina [70], and Capital Area Food Bank of Texas [71].

One example of a regional food bank is the Capital Area Food Bank of Texas. This organization collects and distributes food to the food insecure through churches and associated agencies. The food is then distributed in 21 counties in Texas [71]. This network collaborates with government organizations such as SNAP (formerly Food Stamps), WIC, School Breakfast Lunch Program, Emergency Food Assistance and Elderly Nutrition Programs [24]. Other non-government charities in the area include Caritas, Easter Seals, Fishes, Mobile Loaves, and Casa Marianella [71]. Collectively, their aim is to support individuals of all age groups who need help, shelter and food. In 2015, the Capital Area Food Bank of Texas redistributed 44 million pounds of food to low-income populations in Central Texas [71].

One aspect of food rescue nutrition is the reduction of food loss. A decrease in food waste can be achieved by the food recovery hierarchy proposed by the U.S. Department of Agriculture (USDA) as a food waste management strategy (**Figure 1.1**) [22]. This pyramid consists of five levels: (1) reduction of food production; (2) donation of surplus food to those in need; (3) processing of unwanted food to generate animal food; (4) use of food waste, particularly fats and oils in industry as an energy source (bio-gas or -diesel) via anaerobic digestion; and (5) decomposition of unavoidable food waste to become a natural soil fertilizer [22,23.] Thus, food loss can be decreased by the conversion of unconsumed food into an environmental, economical and societal benefit instead of being disposed in landfills [22,23]. Food rescue nutrition for the transfer of unwanted food to those in need is an important component of food waste management strategy.

The efforts of international organizations in helping to reduce hunger in malnourished populations in developing countries are well known. More recently, there is a new global trend of responding to food insecurity in *developed* countries by food redistribution. In Canada in 2014, collection of unused food from restaurants and grocery stores, and redirection to the impoverished was documented in 29, 68, 122, 90 and 31 food programs in Victoria, Edmonton, Toronto, Québec city, and Halifax, respectively. All these agencies combined provided food benefits to 137,340 Canadians every month [72]. Similarly, the food bank of Australia donated food to the Red Cross, 2,500 community agency and 800 schools. These emergency food programs redistributed food benefits to 900,000 - 2,000,000 individuals [32]. The Dutch Food Bank also is connected with 160

food pantries and 510 associated agencies that provided an annual amount of 37,000 food boxes, supporting 94,000 individuals [73]. In South Korea, the Central Food Bank supplied 407 food banks, which in turn participated in offering food benefits to more than 400,000 Koreans [36]. Thus, food redistribution is occurring at both a national and global basis.

Redistribution of unwanted food to the impoverished is a low-cost method to reduce the gap between food loss and food insecurity in the low-income. This approach lessens food wastage, increases food availability and minimizes the use of natural resources such as water and energy 39. To date the literature lacks documentation regarding the extent of food relocation and the role of programs involved. The aim of this paper is to document the extent of involvement of organizations in food rescue nutrition in the Southwestern United States.

Materials and Methods

Design and Participants

A cross-sectional study was conducted in Spring 2015 to investigate the extent of involvement of organizations in food rescue nutrition. The research was based on the development of a survey to estimate the degree of participation of food networks in the Southwestern States.

A detailed review of the literature was performed to discern the type and services provided by organizations concerned about food rescue nutrition. This information was

utilized to create a survey about the food programs and individuals involved in these activities. The survey was offered to the directors of more than 1000 organizations and partner-agencies of food banks in the Southwestern States (Arizona, the western portion of New Mexico and Oklahoma, Texas, southern Colorado and Utah, the southernmost triangle of Nevada, and the most southeastern portion of California). Organizations were recruited by volunteering in these charitable networks, personal communication, phone and email. Four weekly reminders were sent to the non-respondents via email or phone.

A total of 100 representatives from 1,044 programs completed the survey. Another 240 agencies did not respond, and 704 reported inability to participate because of lack of information regarding the amounts and prices of food, number of clients, and/or having a policy that prevents disclosure of such data.

Pilot Study

An **Organizations Involved in Food Rescue Nutrition Survey** was developed by generating pertinent items from the literature. These items were changed into questions and modified by a panel of nutrition academics and professionals. The initial survey was tested in a pilot study of a focus group of 20 raters who were directors of and/or workers in food redistribution agencies. These raters were recruited from ten organizations (two raters from each program) and administered the initial draft. Content validity of this survey was evaluated by an expert panel of dietitians and nutritionists to consider the comments of the two raters from each organization (face validity). In addition, data were

analyzed to estimate reliability by administration of the survey two weeks apart. The intra-class correlation of the test-rest was $r = 0.9$ ($P = 0.001$), and the paired t-test was $P > 0.05$. Finally, the survey was revised to create the final version.

Instruments

The **Organizations Involved in Food Rescue Nutrition Survey** is a 41-item questionnaire which consists of likert scale and open-ended questions to obtain information about the type and quantities of organizations, number of employees, volunteers and clients served, and locations where food is distributed. It also queries the cost, type, and amount of foods donated. This survey exhibited an internal consistency of Cronbach's α of 0.70, and an inter-rater reliability r of 0.71 ($P < 0.05$).

Analysis of Statistics

Statistical analyses were conducted via the Graduate Pack of the Statistical Package for Social Sciences (SPSS) 19.0 for Windows 2010. Descriptive statistics are presented as mean ± standard error of the mean (SEM) and frequency distributions. Differences between organization type and independent factors (amount and monetary value of food donations, and number of workers, volunteer, clients and programs, services provided, organization function, type of food transportation, location of food distribution, and problems encountered) were assessed. Analysis of variance (ANOVA) was calculated for continuous variables (amount and monetary value of food donations, and number of workers, volunteer, clients and programs). Chi-square tests were

determined for categorical data (services provided, organization function, type of food transportation, location of food distribution, and problems encountered). Bonferoni post hoc and Kruskal-Wallis H-tests were used to compare two or more independent samples of equal or different sample sizes. All two-tailed $P < 0.05$ were considered significant.

Results

Organizations consisted of four types: non-profit (49%) (i.e.; Sustainable Food Center, Tx), religious-affiliated (32%) (i.e.; Rising Hope Food Pantry, Az), private (13%) (i.e.; Food Bank of the Rockies, Co) and community (6%) (i.e.; Family Support Network, Ca). The agencies were involved in the receipt and provision (85%) and donation of benefits (73%). The donations consisted of foods (77%), meals (7%) and/or vouchers (coupons used to purchase food) (5%), and non-food benefits (11%) to those in need.

Figure 2.1 shows the types of donations provided by organizations. These charitable agencies offered a variety of food donations (89%) to clients; including packaged (25.6%), fresh (24.4%) and surplus foods (17.9%), holiday treats (14.1%), and hot meals (4.6%). These organizations also provided non-food services (11%). Types of non-food assistance were comprised of assistance in SNAP and WIC programs (3.3%), nutrition education (3.3), clinical care (1.8%), clothing (1.1%), cooking classes (0.73%), and/or childcare (0.7%).

The mean number of programs that the organizations operated was 3.51 ± 0.47; the maximum was 33. Such agencies included food pantries (38%), emergency programs (28%), shelters/clinics (13%), churches (10%), after school programs (6%) and child camps (5%). Vehicles used to transport the food were trucks (21%), personal cars (20%), and refrigerated vans (10%). In addition, the average monthly number of clients served by the organizations was 41,734.06 ± 20,253.23. Two-thirds of food recipients obtained the donated food and left; whereas, one-third collected or was served the meal which was consumed while seated at the agency.

The average monthly amount of food provided through the charitable networks exceeded 2 million kg, with a total of about 254 million kg. These food benefits had a mean approximate value of ≈ $11 million. The mean quantity of donations obtained by one person and household each month was 22.5 and 225.3 kg, respectively. The average cost of these foods per month was about $36 and $126.70 for each recipient and household, respectively. There were no differences between the types of organizations (nonprofit, religious-affiliated, private and community) regarding quantity and monetary value of donations provided to clients. Moreover, the average number of workers was relatively low (~ 8) and these worked for a weekly average of 35 hours. Some agencies did not have paid workers and were dependent only on volunteers. Consequently, operations of all the charitable networks were based primarily on volunteers (a mean of 3,081 individuals), who provided an average of 16 hours a week.

In Texas, the mean monthly amount of food donations was 207,657 kg, which is provided to 12,862 food recipients and estimated to worth $585,268. The average quantity of foods offered each month for an individual and household approximated 13.2 kg and 94.7 kg, and had a cost of $21 and $97, respectively. The proportion of workers to volunteers was 11 to 216. The employees were involved more frequently in food rescue nutrition than volunteers (22 vs. 12 hours/week). In addition, 50% of the agencies were non-profit, 40% affiliated with a church and 10% were community.

Furthermore, an average of 17% of the organizations reported a change in the number of clients served in the previous year. The proportion was significantly higher in community-based programs, where 59.7% of them indicated an increase in the number of food recipients ($P < 0.05$).

Table 2.1 describes the characteristics of clients receiving foods/meals from the agencies. More women than men received food donations, two thirds were families, more than half was children, and about one-third was non-Hispanic White and one-third, Hispanic as well.

Table 2.1. Characteristics of clients receiving food donations from organizations involved in food rescue nutrition (n = 100)[*]

Characteristic	%	Range
Sex		
Men	43.16 ± 2.59	10.0 - 100
Women	55.12 ± 2.66	5.00 - 90
Household		
Single	32.07 ± 4.05	1.00 - 60
Family without children	21.81 ± 2.86	4.00 - 100
Family with children	45.49 ± 3.89	2.00 - 100
Age		
Children, ≤ 18 yrs	51.86 ± 2.59	1.00 - 100
Adult, > 18 - 64 yrs	30.54 ± 2.51	1.00 - 95
Elderly, ≥ 65 yrs	16.56 ± 1.52	1.00 - 60
Ethnicity		
Non-Hispanic White	36.95 ± 3.28	1.00 - 98
Hispanic	35.31 ± 2.98	1.00 - 85
African American	20.88 ± 2.72	1.00 - 95

[*] Mean ± SEM.

Figure 2.1. Types of donations provided by organizations involved in food rescue nutrition (n = 100)

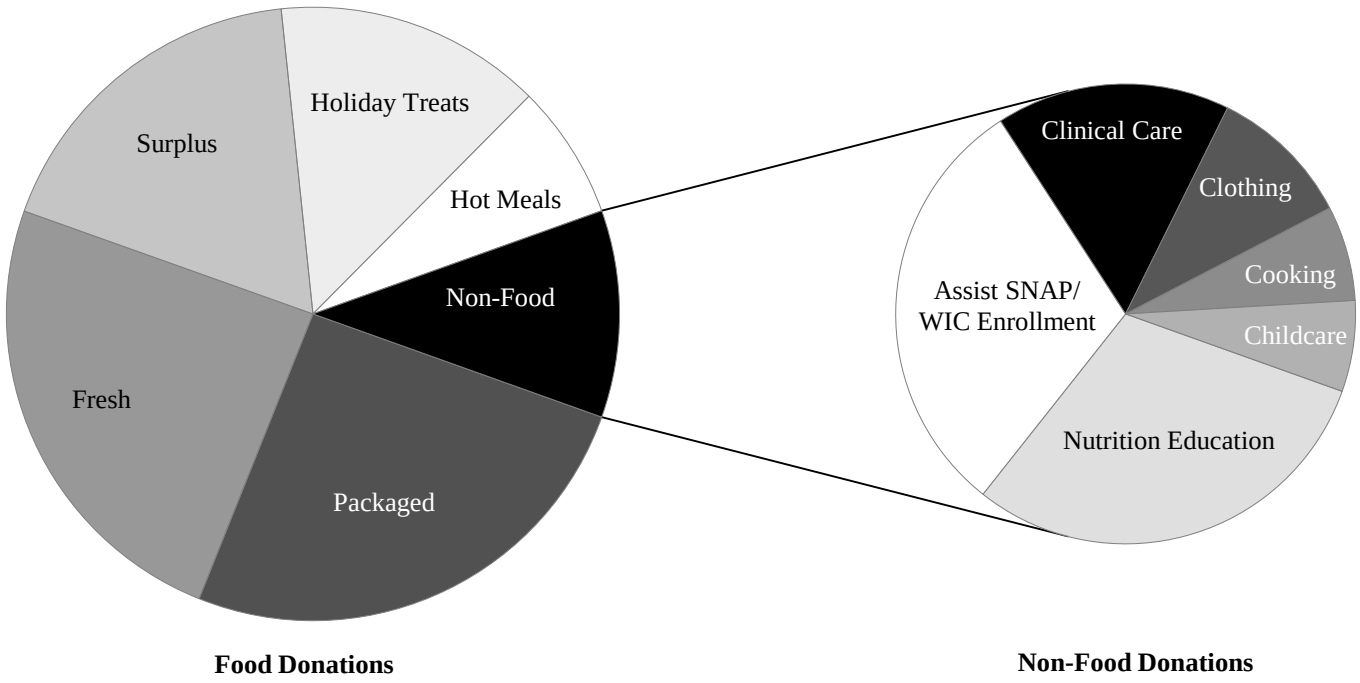
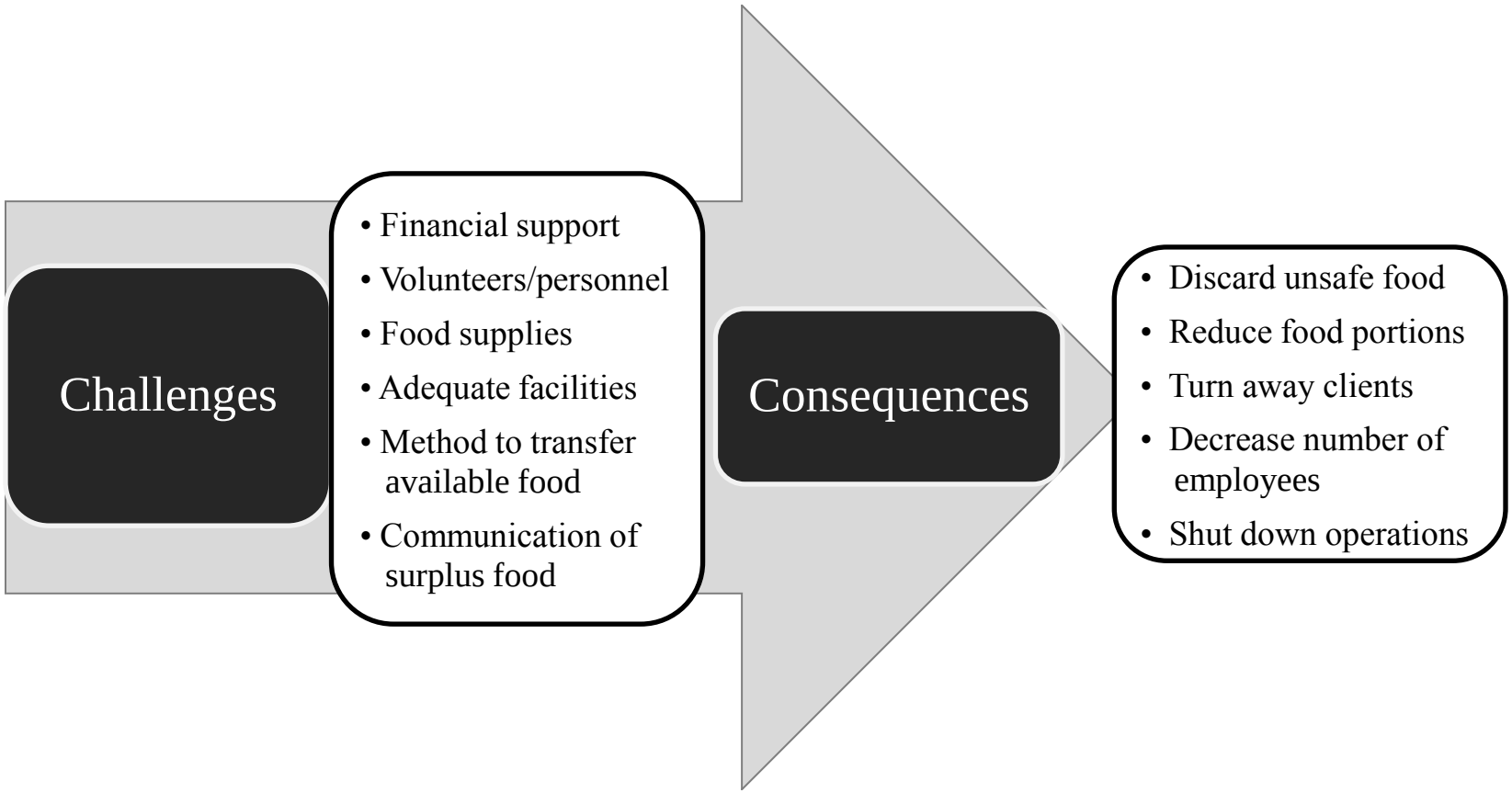


Figure 2.2. Challenges and consequences encountered by food rescue nutrition organizations in the previous year (n = 100)



Approximately 86% of the organizations encountered significant challenges in the past year as illustrated in **Figure 2.2**. Challenges included lack or sustainability of financial support (27.8%), availability of volunteers and/or personnel (21.7%) and food supplies (21.3%), adequate facilities (15.7%), transfer of available food (7.4%), and/or communication about surplus food that could be donated before expiration (6.1%). In the previous year, adverse consequences were that 44.6% of agencies discarded unsafe food, 33.9% reduced the portion of food (33.9%), 10.7% turned away clients, 8.3% decreased the number of employees, 2.5% and/or shut down their operations.

Discussion

The results of the present study indicate that the extent of involvement of organizations in food rescue nutrition was relatively high. About half of the agencies were nonprofit, providing an average of 2.13 million kg of food to more than 40,000 clients a month. In Texas, we observed that 207,657 kg (457805 lb) of food donations provided to 12,862 clients in Texas. These findings are lower than what is reported by Companion who surveyed 17 food banks in Texas [74]. For instance, Companion [74] found that the investigated programs had allocated 19,464,944 lb of food to 171,500 clients. Approximately, 15% of the food recipients were, at or above, 100% of the poverty line. All of these programs were focused on reducing food insecurity.

Approximately one-third of the agencies in the present research were affiliated with a church. This amount is less than that reported by Cashwell et al. [75] in 2004 in which 72% of 235 associations in Mississippi and Alabama were religious-based. In Canada, Tarasuk et al. [72] reported that 58.2% of 340 organizations were faith-based. The Canadian charitable programs also provided monthly food assistance for 137,340 clients, and contained 3090 workers, with 84.13% being volunteers. Eisinger et al. [76] also reported that the ratio of employees to volunteers, who worked in agencies involved in food donation in Detroit, was 4 to 920 [76]. This proportion is higher than that of the present research; in which we found ~ 8 workers to 3,081 volunteers. In addition, some community-based or private organizations did not have any employees - just volunteers.

The programs in this research collected and/or redistributed food to underprivileged individuals, irrespective of their sex, age, and ethnicity. Furthermore, some agencies were shelters that receive perishable foods and pre-prepared meals to nourish their clients, and distribute clothes and medical care such as Street Youth Ministries (Austin, Texas) and Hour of Truth Ministry (Hanford, California). Yet, not all food rescue nutrition organizations provided food to their clients. For example, the Sustainable Food Center (Austin, Texas) is a nonprofit association that offers seeds, plants and food systems education to teach individuals and schools about gardening, in order to help make healthier food choices and cooking. No food or money is provided to clients. In North Florida, food pantries also have medical and dental clinics, and offer clothes, towels, personal hygiene supplies and childcare to the clients [77].

The present study reported barriers that threatened the continuity of donating food to the disadvantaged. These included scarcity of volunteers, funding, supplies and cooperation of donors. These shortcomings have resulted in a reduction in the amount of donations and turning away clients. Several studies have reported similar findings in the U.S. [77-80], and Canada [72,81,] 76. Directors of programs in this research indicated that the longevity of operations and reduction of food loss are dependent on increasing transfer and distribution of surplus food. These challenges can be improved by increasing the number of volunteers, and amount of money and food donations; having larger vehicles for food transport; bigger storage capacity; and better communication between providers. Davis et al. recently indicated that transportation of perishable foods and fresh produce using refrigerated trucks in a timely manner was important to ensure arrival to delivery locations in good condition [83].

A limitation of this research is the low response rate of organizations involved in food rescue nutrition. The vast majority (67.4%) reported privacy concerns. In addition, the size of the recruited agencies varied greatly, making statistical comparisons difficult. Strengths of the current research were inclusion of 100 agencies from eight states, and a variety of programs. This research also provided solutions to improve food allocation to food banks, pantries and soup kitchens.

Conclusions

The extent of involvement of community-based programs in food rescue nutrition was strong in eight Southwestern states in the U.S. Overall participation of the charitable programs was relatively high. Agencies involved in food collection and redistribution provided critical nutritional support to the food insecure. Thus the impact of food donations on food security and nutritional status should be explored in greater detail and given more emphasis as a mean of reducing food insecurity as a relatively low-cost option. Future studies should examine the role of food rescue nutrition in reducing food loss by evaluating the amount of both food wasted versus that rescued (donated to those in need). Furthermore, operations and sustainability of these networks are dependent on the availability of resources, particularly money, food and volunteers. Health professionals should encourage support for these charitable agencies through the donation of time, money and/or food. Social media including Facebook and Twitter could promote advertising about the agencies involved in food rescue nutrition, their role in rescuing food and the need for food donations and volunteers. Finally, grocery stores and food outlets should be given recognition by the community for their efforts in donating unwanted foods to be redistributed to those in need.

CHAPTER 3. MOTIVATIONS FOR VOLUNTEERS IN FOOD RESCUE NUTRITION

Abstract

Background: A variety of organizations redistribute surplus food to low-income populations through food rescue nutrition. Why volunteers participate in these charitable organizations is unclear.

Objective: The aim of this study is to document the participation and motivations of volunteers who are involved specifically in food rescue nutrition.

Design: A cross-sectional study was conducted in two phases. In phase 1, a new instrument, Motivations to Volunteer Scale, was developed and validated in 40 participants (≥18 years). In phase 2, the new scale and demographics questionnaire were administered to 300 participants who were volunteering in food pantries and churches.

Results: The pilot study showed that the Motivations to Volunteer Scale exhibited an internal consistency of Cronbach's α of 0.73 ($P < 0.01$), and a reliability from a test-retest of times 1 and 2 was $r = 0.9$ ($P < 0.05$); the paired t-test was insignificant ($P > 0.05$). The scale was validated also by comparison to the Volunteer Function Inventory ($r = 0.86$, $P < 0.05$). Constructs of the newly developed scale were: requirement, career improvement, social life and altruism. The mean motivation score of the 300 volunteers was 9.15 ± 0.17. Greater motivations were observed among participants who were ≥ 30 years old,

women, Hispanics, college/university graduates, physically inactive, non-smokers, and had an income ≥ $48,000.

Conclusions: The Motivations to Volunteer Scale is a valid tool to assess why individuals volunteer in food rescue nutrition. The extent of motivations of participants was relatively high and the primary reason for volunteering was altruism.

Introduction

In the U.S., the amount of food that is deposited in a landfill has been estimated to be 30-40% of total waste [1]. This large quantity of food waste is somewhat shocking, as 13.4% of the U.S. population has been reported to lack food security and does not know the source of their next meal 65. One approach to reduce food loss is the redistribution of surplus food to a low-income population that is in need.

In recent years, a large number of communities have become involved in food rescue nutrition by the creation of charitable networks of organizations that reallocate unwanted food. The magnitude of this reused food in the U.S. population is huge. For example, Feeding America (formerly Second Harvest) was created to fight hunger in 1975. Today, it is the biggest non-profit national program of its kind. In 2015, this program donated an approximate annual amount of 800 million pounds of food, supporting 60,000 pantries that fed 46.5 million individuals [39].

Other national, volunteer-based food networks exist in the U.S. including Campus Kitchens Project, Donate Don't Dump and We Don't Waste [41]. This Samaritan approach of food relocation occurs due to the efforts of both employees and volunteers. The focus of this paper is to explore why volunteers chose to donate their time to food rescue nutrition.

The reasons for volunteer participation in this field are complex. Motivations are hypothetical constructs that describe the rationales for actions and behaviors of individuals, explaining why and how one acts and responds to issues [43]. In 2007, a national study investigating community service in 1,454 adults from 48 states found that almost half (48%) were women, aged 25 - 74 years. The principle motive cited for volunteering was the personal and social importance of providing support to society to help the food insecure. These intentions included: empathy and morality, commitment to ideals, having better income, and being in a relationship [84].

The 2005 Current Population Survey investigated the effect of life events on volunteerism in 90,000 adults. Two-thirds of participants were women, with an average age of 45 years. More than three quarters of the volunteers were Caucasians, married, employed and had a mean annual income of $77,936. Participants who were male and divorced were less likely to volunteer by at least 10-fold. Being White, married, employed, educated, and having children and high income increased the likelihood of volunteering by more than 2-fold ($P < 0.05$) [85]. Thus, a higher income and education level and being married are associated with greater volunteerism.

Numerous scales have been developed to measure characteristics of volunteers [86-93]. However, these studies did not assess the reasons for volunteering in the redistribution of food to those in need. The aim of this paper is to document the extent of participation and motivations of volunteers who are involved specifically in food rescue nutrition.

Materials and Methods

Design

A cross-sectional study was conducted in Spring 2015 in two phases. In phase 1, a new instrument, Motivations to Volunteer Scale, was developed and validated in 40 volunteers. In phase 2, the scale was tested in 300 adults (≥18 years) involved in food rescue nutrition. These volunteers were recruited from locations of food redistribution such as food pantries and churches.

All participants were administered the demographic and motivation questionnaires in one visit. The demographics questionnaire contained information about personal characteristics and socio-economic status. The Motivations to Volunteer Scale queried reasons and intentions for participation in food rescue nutrition.

Participants

A total of 340 individuals (≥18 years) volunteering in charitable organizations were recruited from locations of food donation by use of flyers and personal

communication (via volunteering in food rescue nutrition agencies). The nature of the research was explained, and informed consent was obtained. The protocol of this study was approved by the Institutional Review Board at the University of Texas at Austin.

Instruments

The Demographic Questionnaire utilized was based on previous research in this laboratory [94], and slightly revised. Information was obtained about age, sex, ethnicity, weight, height, education, marital status, occupation, and socioeconomic status and self-reported health.

The Motivations to Volunteer Scale was derived initially from concepts found in a literature survey. A preliminary scale was tested for content validity by a panel of nutrition academics and professionals, and then revised. This 21-item scale instrument includes information about type, frequency, duration, and motive to participate in food rescue nutrition. Then this instrument was tested and validated in a sample of 40 volunteers. The final scale exhibited an internal consistency (correlations between items and total score) of Cronbach's α of 0.73 ($P < 0.01$). To confirm reliability, the scale was administered to the same participants 2 weeks apart. The intra-class correlation of times 1 and 2 was $r = 0.9$ ($P < 0.05$), with an insignificant paired t-test ($P > 0.05$).

For additional validation, the 1998 Volunteer Function Inventory was administered to the same 40 individuals. This older instrument measures motivations to volunteer in general [95]. The total score of the new Motivations to Volunteer Scale (top

score = 14) correlated well with that of the Volunteer Function Inventory (top score = 30) ($r = 0.86$, $P < 0.05$).

To measure construct validity, factor analysis was performed on the scores of Motivations to Volunteer Scale of the total sample (N = 300) [96]. Constructs of the scale were identified and grouped as four areas: requirement, career improvement, social life, and altruism. This scale consisted of 21 statements that described whether the individual agreed (score = 1) or disagreed (score = 0) with reasons underlying their motivation for volunteering in food rescue nutrition. Items that were associated with a negative influence on motivations to volunteer were reverse coded, such that a higher score reflected greater motivation.

Analysis of Statistics

The Graduate Pack SPSS 19.0 for Windows 2010 was used to analyze all data. Descriptive statistics are presented as mean ± standard error of the mean (SEM) and frequency distributions. Differences between motivations of volunteers and independent variables were assessed (including age, sex, ethnicity, education, occupation, income, weight, exercising and smoking statuses, employment, hours volunteered, type and sponsor of organization, and location of distribution). The ANOVA tested significant differences between continuous factors (age, body mass index, income, working and volunteering hours, and total motivation score). Chi-square tests were determined for categorical data (age, weight and income categories, sex, ethnicity, education, physical activity, health and smoking statuses, and type and sponsor of organization).

Factor analysis assessed construct validity via principal component analysis with varimax rotation. The *a priori* classification of subscales was confirmed and the number of latent variables and factors of the Motivations to Volunteer Scale was established. Factor loadings of items ≥ 0.4 were retained in the final version, resulting in four factors[96]. Internal consistency was estimated using Cronbach's α; values ≥ 0.6 were considered acceptable. Bootstrapping estimated the role of age and education level of the volunteer (the mediator) as mediators of the relationships between the independent variable (total motivation score) and dependent variables (four subscales: service requirement, career improvement, social life, altruism). Multivariate regression models measured associations between total score of motivations, requirement, career improvement, social life and altruism with the independent variables (age, weight status, income, weekly working and volunteering hours). The Bonferoni post hoc test and Kruskal-Wallis H-test were used to compare two or more independent samples of equal or different sample sizes. All two-tailed $P < 0.05$ were considered significant.

Results

Table 3.1 shows the characteristics and motivation scores of volunteers in food rescue nutrition. The mean age of volunteers was 29 years, with a range of 18 - 68. Almost two thirds of the individuals were women and almost three-quarters were non-Hispanic White. Most participants had a 4-year college/university degree, and two-thirds of the sample had an annual income < $17,500. Approximately, three quarters of the

adults were physically active and did not report any health problems; almost all were non-smokers.

The mean motivation score of the Motivations to Volunteer Scale was 9.15 ± 0.17, ranging from 1 to 14. Over half (57.6%) had a score of 10 and above. Nine participants (3%) agreed with only one motivation on the scale, "requirement for community service for court order" for a total score of 1. Greater motivation scores were observed in participants who were > 45 years old, women, of Hispanic ethnicity, with a college or university degree, income of $48,000 to $60,000, physically inactive, reported health problems and were non-smokers.

The relationship between motivation scores and the varying types of organizations are presented in **Table 3.2**. A higher motivation score was observed in individuals who volunteered at religious or community non-profit organizations, food pantries or soup kitchens and distributed food at the same location of the organization as compared to non-profit agencies, programs that offer non-food benefits and distributed food at a site that is far from the organization building, respectively ($P < 0.05$).

The average amount of time spent as a volunteer was 4 hours a week (3 - 15 hours). Activities reported included serving food (35.4%); carrying donations of the elderly, women or clients with a disability to the bus stop or vehicle (20.4%); sorting foods (17.9); clerical work (9.8%); management and childcare (6.3%); or gardening (1.9%). Volunteers also taught cooking classes (5.4%), were ambassadors (1.9%), or transported food (1%).

Table 3.3 shows that the Motivations to Volunteer items were grouped via a factor structure to create four constructs: requirement, career improvement, social life and altruism. These scales created a total variance accounted for by 76.6%, and the requirement subscale had the highest variance. Three items loaded on the requirement subscale: volunteering to fulfill a specific service obligation by an educational institution, organization service or the court. The negative loading factors of the latter two reflect a negative correlation between the item and the factor. The factors of career improvement had a cluster of five motivations that described being motivated due to enhancement of a future profession, curriculum vitae and experience. Similarly, five items clustered around social life, suggesting the importance of broadening the social network by meeting people and reducing loneliness. Finally, eight items loaded on altruism, the satisfaction that occurs in helping the less fortunate ($P < 0.05$) (**Table 3.3**).

Moreover, 15.7% of volunteers participated in food rescue nutrition to meet a service requirement, 27.5% to improve their career options, 27.5% to broaden their social network, and 29.4% for altruistic reasons. The role of age and education in mediating the relationship between motivations and the four subscales was insignificant.

Table 3.4 indicates that the scale constructs were significantly associated with each other. For instance, involvement in food rescue nutrition due to requirement was directly associated with volunteering to improve career (after controlling for social life and altruism factors), but inversely with broadening social network (after controlling for service requirement and altruism factors) and/or due to altruism (after controlling for

service requirement and social life factors). Career development also increased the likelihood of volunteering due to requirement, improving social life (after controlling for service requirement and altruism factors) and being altruistic by about 28, 0.9 and 1.3 fold, respectively. Furthermore, the probability of involvement in food rescue nutrition to broaden the social network increased due to the ability of the individual to develop one's career, feeling altruistic and not being obliged to volunteer (after controlling for career improvement and social altruism factors). Finally, altruistic intentions increased the possibility of volunteerism due to career development and/or social life expansion (after controlling for service requirement and career improvement factors) by ~ 2 fold, respectively ($P < 0.05$).

Discussion

This study suggested that the degree of involvement and motivations of participants in food rescue nutrition were relatively high, as more than half scored above 10 on the motivations scale. The most prevalent motivator was altruism (29%), followed closely by career and social life improvement (28%). Those who volunteered to fulfill an obligation (16%) had the lowest scores of all ($\overline{x} = 1$).

Table 3.1. Characteristics and motivation scores of volunteers in food rescue nutrition (n = 300)

Characteristic	N	Motivation score	Range
	← % →	← Mean ± SEM →	
Age, yr			
18 - 25	221 (73.7)	8.97 ± 0.20 [a]	1 - 14
26 - 45	34 (11.3)	7.94 ± 0.74 [a]	1 - 14
46 - 68	45 (15.0)	10.93 ± 0.13 [b]	10 - 13
Sex			
Men	104 (34.7)	7.96 ± 0.29 [a]	1 - 14
Women	196 (65.3)	9.78 ± 0.21 [b]	1 - 14
Ethnicity			
Non-Hispanic White	221 (73.7)	9.27 ± 0.2 [a,b]	1 - 14
African American	42 (14)	8.26 ± 3.39 [a]	3 - 14
Hispanic	37 (12.3)	9.65 ± 0.35 [b]	6 - 12
Education			
High school	4 (1.3)	6.05 ± 3.18 [a,b]	1- 12
Partial college	6 (2)	8.67 ± 0.53 [a]	7 - 10
College/university	279 (93)	9.36 ± 0.17 [a]	1 - 14
Graduate school	8 (2.7)	3.63 ± 3.62 [b]	1 - 8

.

Table 3.1. Continued

Variable	N	Motivation score	Range
	←%→	← Mean ± SEM→	
Income, $/yr			
< 17,500	200 (66.7)	8.79 ± 0.20 [a]	1 - 14
17,500-47,000	32 (10.7)	7.53 ± 0.82 [a]	1 - 14
48,000-66,000	38 (12.7)	11.24 ± 0.24 [b]	10 -14
67,000-80,000	30 (10)	10.67 ± 0.19 [b]	8 -12
Regular physical activity			
Yes	221 (73.7)	8.33 ± 0.20 [a]	1 - 14
No	79 (26.3)	11.46 ± 0.14 [b]	10 - 14
Health*			
Healthy	232 (77.3)	8.88 ± 0.21 [a]	1 - 14
Health problem	68 (22.7)	10.09 ± 0.29 [b]	3 - 13
Smoking status			
Yes	11 (3.7)	5.27 ± 0.89 [a]	1 - 14
No	289 (96.3)	9.30 ± 0.17 [b]	3 - 13
Total score	300 (100)	9.15 ± 0.17	1 - 14

Different superscripts in columns indicate significant differences within categories at P<0.05.
* Self-report.

Table 3.2. Motivation scores of volunteers according to type of organization (n = 300)

Variable	N	Motivation score	Range
	← % →	←Mean ± SEM →	
Organization sponsor			
Nonprofit	148 (49.3)	9.04 ± 0.23 [a]	5 -14
Religious-affiliated	142 (47.3)	9.66 ± 0.24 [a]	1 - 14
Private Nonprofit [*]	10 (3.3)	3.50 ± 0.83 [b]	1 - 6
Organization type			
Food Pantry	242 (80.7)	9.24 ± 0.18 [a]	1 - 14
Soup Kitchen	48 (16)	9.88 ± 0.39 [a]	1 - 14
Non-Food [¶]	10 (3.3)	3.50 ± 0.83 [b]	1 - 6
Location of distribution			
Same location as organization	142 (47.3)	9.66 ± 0.24 [a]	1 - 14
At different location [∞]	158 (52.7)	8.69 ± 0.25 [b]	1 - 14

[a b] Different superscripts between rows indicate significant differences within categories at P<0.05.
[*] Organizations established by Samaritans to provide food and shelter such as Caritas of Waco and Berkley Food Pantry.
[¶] Childcare, clothes, personal hygiene, and health.
[∞] Parking lots and mobile food pantries.

Table 3.3. Factor structure of the Motivations to Volunteer Survey administered to Volunteers (n = 300)

Factor	Item	Reliability	Factor loadings				Variance
			Requirement	Career	Social	Altruism	
		← Cα* →					← % →
Service requirement for		0.73					23.4
	Academic/school		0.85				
	Social group		- 0.48				
	Court order		- 0.45				
Career improvement		0.84					21.5
	Increase career options			0.93			
	Improve Curriculum Vitae			0.81			
	Enhance knowledge			0.78			
	Have new experience			0.68			
	Improve self-esteem/ social acceptance			0.61			
Social life		0.84					20.9
	Enjoys environment				0.86		
	Gives life purpose				0.86		
	Decreases loneliness				0.72		
	Meets new people				0.67		
	Forgets problems				0.67		

Table 3.3. Continued

Factor	Item	Reliability	Factor loadings				Variance
			Requirement	Career	Social	Altruism	
		← Cα* →					← % →
Altruism		0.83					10.8
	Want to help community					0.93	
	Help the needs of others					0.93	
	Positively change society/ community					0.79	
	People I know volunteer					0.69	
	Feel rewarded/satisfied					0.65	
	Care about others					0.56	
	Know those who used to go to bed hungry					0.44	
	Want to be part of this cause					0.42	

* Cα is Cronabch's alpha coefficient, which estimates the reliability of a psychometric test.

Table 3.4. Association between motivational factors for volunteers (n=300) [*]

Motivations	Odds Ratio (OR) [∫]	95% CI for OR	P
Service requirement			
Career improvement [¶]	1.47	(1.23 - 1.66)	0.000
Social life [¶]	- 0.48	- (0.40 - 0.57)	0.000
Altruism [¶]	- 0.37	- (0.29 - 0.46)	0.000
Career improvement			
Requirement	27.58	(10.19 - 74.61)	0.000
Social life [¶]	0.87	(0.77 - 0.99)	0.032
Altruism	1.34	(1.11 - 1.61)	0.002
Social life			
Requirement [¶]	- 0.14	- (0.08 - 0.25)	0.000
Career improvement	0.66	(0.54 - 0.80)	0.000
Altruism	1.46	(1.21 - 1.77)	0.000
Altruism			
Requirement [¶]	0.00	0.00	0.995
Career improvement	1.97	(1.14 - 2.76)	0.000
Social life [¶]	1.84	(1.55 - 2.18)	0.000

[*] Statistically significant at $P < 0.05$

[∫] Odds Ratio (OR) measures the association between motivations to volunteer; service requirement, career improvement, social life, and altruism. The OR increase multiplicatively by exp(β) for every unit increase in the predictor.

[¶] Controlling for all variables.

Altruism has been reported by others as a major factor for volunteering. In 525 adults in the U.S., Ahn et al. [97] found that satisfaction with, and perception of, the importance of involvement in the community increased the likelihood of volunteering by 1.8 and 2.4 fold, respectively ($P < 0.05$). In Croatia, 136 volunteers who engaged in a community service for up to 8 years described self-sacrifice ($\beta = 0.49$, $P < 0.001$) as the major impetus [98]. In the Netherlands, it was women, rather than men, who tended to give back to their country more frequently because of altruism towards others [99]. Similar to our findings, women were more motivated to volunteer than men, and the likelihood of volunteers to participate in food rescue nutrition increased by about 2 fold due to altruistic motives ($P < 0.001$).

Less than one third of the present sample volunteered in order to develop their resume or have an experience in their "field of work." Our participants also showed that involvement in food redistribution to develop their future profession was stimulated by a requirement to volunteer (28 fold) and by altruism (1.3 fold) ($P < 0.05$). Several studies mentioned the current findings that volunteering could improve future career options, but did not record the number of individuals involved [95,100,101]. Thus career development appears to be a significant reason for participation in food rescue nutrition.

A study by Matsuba et al. [84] indicated that volunteerism was correlated with the opportunity to broaden one's social network ($r = 0.34$, $P < 0.01$). In our study, individuals were more likely to volunteer in order to expand their social network when improving their career, being altruistic, and/or not being forced to participate ($P < 0.001$). In

addition, the chance to meet people and expand social networks was a motivation for over one-quarter of volunteers in our sample. This is far greater than that found in a French survey [102], in which only 57 individuals (3.6%) of the 1,578 individuals volunteered in humanitarian agencies. Rather these French participants provided help to associations involved with culture, sports, religion, education, politics and environment[102].

In Japan, volunteerism exhibited positive associations with broadening one's social life by developing relationships with staff [OR: 3.5 (1.3-9.8), P = 0.016], clients [OR: 3.8 (1.4-10.8), P = 0.011] and other volunteers [OR: 5.2 (1.8-14.4), P = 0.002] [103]. This investigation is in agreement with the current research findings, in which the probability of individuals to volunteer due to expansion of their social network increased by ≈ 1.5 fold ($P < 0.001$). However, the Japanese participants were older (mean age 60.5 years) and had a greater incidence of unemployment [103] than our population.

Tarasuk [104] reported that some individuals volunteered to donate food to in order to complete hours of a community service, but did not provide the numbers involved. In our study, 15.7% cited this reason. Furthermore, 3% of the sample had a total score of 1; these volunteers participated only due to a requirement to fulfill a community service for a social group or court order, and had no other reason to volunteer. Stukas et al. [48] examined mandatory engagement in community activism in 371 students who required it in order to graduate. Those who performed community service freely were more likely to be involved again in the future than those who were forced to do so (4.99 vs. 4.04, P <

0.01). This supports the present outcome in which obligatory volunteerism had the lowest motivation scores, and their scores were inversely related to altruism.

In this research, engagement in food rescue nutrition was more pronounced in individuals who were non-smokers and not physically active. Yet it should be noted that smoking was not permitted during this type of work. A higher educational level also was associated with greater motivation. Work by Forbes and Zampelli [105] support our findings, in that higher level of education increased the probability of volunteerism by about 33% to 56% ($P < 0.05$). Matsuba et al. [84] also found that education had a positive association with being involved in community service ($\beta = 0.08$, $P < 0.01$). In our study however, graduate students had the lowest motivation score of all, which might be due to their need to fulfill a school requirement. Yet, we did not find a significant effect for education in mediating the relationship between motivations to volunteer and a service requirement.

In our study, volunteerism in food rescue nutrition was higher in older participants ($P < 0.05$). Matsuba et al. [84] also showed that community service was indirectly correlated with age ($r = 0.05$), and education ($r = 0.03$) through the perception of one's role as a community activist ($P < 0.05$). Others observed that the frequency of volunteering increased with age [102],[106] in both men and women, and peaks after age 40 years [107]. In contrast, about three quarters of our sample were young (18 -25 years), but age was not a mediating factor on total motivation score and volunteerism to improve one's career.

Motivations to volunteer were greater among our participants with higher incomes ($48,000 - 80,000). In 170 volunteers in Michigan, more frequent participation also was reported in those with a better socioeconomic status (≥ $35,000 vs. ≤ $10,000) [108]. The Center on Philanthropy Panel Study documented that those with a greater mean annual income volunteered more ($86,196 vs. 63,098) [85].

Higher motivation levels were observed in individuals who volunteered at a religious organization (47%), and soup kitchen or food pantry (97%), as compared to those who volunteered at a private non-profit agency (3.3%) or a network that donated non-food items (3%). The Midlife in the U.S. Survey also found that 51.7% of 3,032 volunteers were involved in religious giving [109]. Similarly, 19.3% of 1578 French adults volunteered at faith-based organizations [102]. Borgonovi et al. [46] observed that volunteering at a church was associated with having a better health status ($\beta = 0.19$, $P < 0.01$).

In our research food distribution was conducted most often at the same location of the organization such as in a room in the building of the church or food pantry. Yet it also occurred at places far from the main building such as in parking lots of grocery stores and schools, and mobile food pantries. Motivations were lower among volunteers who had to travel to places that were far from the agency building. Reduced volunteerism at distant places might be that travelling was difficult for some individuals due to limited transportation or increased cost.

Our volunteers reported diverse activities such as sorting donations, serving food/meals, meal preparation and childcare. Tarasuk and Eakin [110] also reported sorting donated foods by categorizing them according to type, expiration date and quality, discarded food items that are in a bad condition, outdated or rotten. In the Second Harvest North Florida, individuals helped with food distribution to recipients and taking care of children, and carried the bags of food donations for the clients [77]. Carrying food donations is an important activity as the weight of the food donations can be quite heavy.

This study also showed that the newly developed Motivations to Volunteer Scale is a valid instrument to identify reasons why individuals volunteer in food rescue nutrition. In addition to a strong correlation with the 1998 Volunteer Function Inventory ($P < 0.05$), the factor structure of the newly developed scale is shorter (21 statements) and thus reduces response burden [95].

Other instruments that have been developed to assess volunteerism include the Furnham scale which tested one's beliefs about the world justice [86]; the Bales Volunteerism-Activism scale to evaluate attitudes that encourage individuals to help others [87]; the Helping Attitudes Scale to assess beliefs, feelings and behaviors that underlie motivations to volunteer [88]; and the Attitude Toward Helping Others Scale by Webb et al. which discerned beliefs and feelings of consumers regarding donating money to charitable agencies [89]. Other scales have been the Helping Power Motivation Scale to discuss the role of decision making in promoting volunteerism [90]; the Charity Values Scale that examined the influence of personal values (belief in adventure, creativity or

empowering others) [91]; the Philanthropy Scale to assess the individual's feelings of being responsible toward one's community [92]; and the Volunteer Motivation Scale that measured feelings of satisfaction and happiness generated in sports activities [93]. Although all these scales measured volunteerism in general or were unconcerned with donating money or sports, our Motivations to Volunteer Scale is the first to assess intentions regarding food redistribution to those in need.

We also observed that the subscales of the Motivations to Volunteer; volunteerism due to service requirement, career improvement, social network expansion and altruism, were significantly associated with each other. These constructs increased the probability of involvement in food rescue nutrition. Furthermore, the reasons of volunteerism that we found shared similarities only with the Volunteer Function Inventory [95]. The latter questionnaire consisted of six constructs: career, social, values, understanding, protective, and enhancement [95]. Both scales resulted in motives that are associated with career development, social life expansion and altruism, yet contained different items [95].

A limitation of this study is that factor analysis of Motivations to Volunteer was conducted on a population sample of 300. Thus temporal stability could not be achieved, as the test-retest was conducted only in 40 adults of the pilot study. Future research should consider the stability of the factor structure of this scale over time in a larger population. In addition, the use of a likert scale would have provided a better range of response options. Strengths of the current research were inclusion of 300 participants

from a variety of programs, and documentation of the relative validity by a significant correlation with the Volunteer Function Inventory [95].

Conclusions

The Motivations to Volunteer Scale is a valid tool to assess why individuals volunteer in food rescue nutrition. The extent of involvement and motivations of participants was relatively high. The main reasons why individuals volunteer were distributed equally among meeting requirements, career improvement, broadening social life, and altruism. Volunteerism was greater in those who were older, women, Hispanic, and had a university degree or higher income. Involvement in food rescue nutrition was greater if the organization was faith-based, a food pantry or soup kitchen.

Future investigations are warranted to examine methods which promote satisfaction, continuous engagement, and retainment of volunteers in food rescue nutrition. Social media such as Facebook and Twitter could help in advertising about the agencies involved in food rescue nutrition, their role in rescuing food and need for volunteers.

CHAPTER 4. IMPACT OF FOOD DONATIONS FROM A FOOD PANTRY ON NUTRITION STATUS OF A LOW-INCOME POPULATION

Abstract

Background: In 2015, 3.5 million Americans lived below the poverty threshold. This state of limited financial resources diminishes the ability to purchase adequate quantities of healthy foods and increases the risk of food insecurity. In response, charitable organizations have created food pantries that provide free foods to those in need.

Objective: The objective was to assess the impact of food donations on total nutritional status of recipients of a food pantry.

Design: A cross-sectional study was conducted in Fall 2015, in which 112 adults were recruited from a food pantry in Central Texas. Participants were administered a demographic questionnaire, food frequency questionnaire and list of food donations. Nutrient intakes of diets were calculated, and then compared to Dietary Reference Intakes (DRI) and the 2015-2020 Dietary Guidelines for Americans.

Results: The food pantry provided food donations twice a month that included a variety of food such as fruits, vegetables and bakery products. The food donations added substantial amounts of nutrients to the diet, ranging from 10 to 110% of the DRIs. The

donations accounted for more than half of the client's daily intake of energy, carbohydrates, protein and fat, vitamins B_6 and B_{12}, phosphorus, cupper and selenium. Yet daily total intake remained less than their DRIs for dietary fiber, fat soluble vitamins and vitamin C, and was even lower for calcium, magnesium and potassium. Phosphorus content of food donations was high, presumably due to the inclusion of good sources of this mineral (meat, milk, bakery products and pasta). The total food intake of those using the food pantry almost met the 2015 U.S. Dietary Guidelines for refined grains, fruits, vegetables, and meat; however, the amount of whole grains and dairy foods was inadequate.

Conclusions: Dietitians, nutritionists and health professionals should be encouraged to volunteer and support organizations that provide food donations. These supplemental foods are an important resource for improving the nutritional status of low-income populations.

Introduction

In 2015, 3.5 million Americans lived under the poverty threshold, defined as $11,880 per capita [2]. The insufficient resources of these low-income individuals reduce their ability to purchase adequate quantities of healthy foods and increase their risk of food insecurity [58, 65].

In the U.S., low-income households receive food-related assistance from an abundance of government programs, such as the SNAP (formerly Food Stamps), WIC, School Breakfast Lunch Program and the Emergency Food Assistance Program. Each program distributes either foods or meal benefits [24]. There are also numerous charitable organizations in the private sector that have created food pantries and soup kitchens that provide free foods to those in need. These include non-government community agencies and religious organizations [41] such as Feeding America [39], Donate Don't Dump [111], We Don't Waste [112], Campus Kitchen Project [113] and the Capital Area Food Bank of Texas [114]. All of these networks offer free foods to the low-income, irrespective of age, sex or ethnicity. Collectively, these programs help bolster the quantity of foods available in the diet and can drastically improve the nutritional status of these low-income recipients. This research will concentrate solely on the impact of food donations of food pantries on the improvement of nutrient intake in a low-income population.

Several studies have examined the economical and nutritional status of food recipients. For instance, an interview-based investigation by Daponte et al. [115] reported that 43.5% of 174 low-income households in Pennsylvania received benefits from food pantries. About 51% of the families had an annual income < 185% of the poverty line. In Alabama, a cross-sectional study by Duffy et al. [38] explored the total diet of food pantry recipients, but not the contribution of the donation. A 24-hour dietary recall was administered to 55 low-income participants utilizing a food pantry. Of these, 61% were observed to have a poor diet quality, as defined by the 2005-HEI. In fact, 67%, 69% and

25% did not report any consumption of fruits, vegetables or whole grains, respectively. In a national study of 528 recipients from food banks, Holben et al. [116] also found that the intake of fruits (1.3 servings) and vegetables (1.7 servings) was less than that recommended, by 0.7 portions. In Canada, McIntyre et al. [118] documented that 54.6% of 141 low-income women used food banks. Daily nutrient intakes of all participants were below the Dietary Reference Intakes for vitamin C, iron and vitamins B_6, A, B_1 and B_2[66,117] by 63%, 42%, 42%, 33%, 28% and 18%, respectively. It is not surprising that those who use food assistance programs often have diets of low to moderate nutritional quality.

The purpose of this study was to assess the impact of food donations on total nutritional status of recipients of a food pantry.

Materials and Methods

Design

A cross-sectional study was conducted in Fall 2015 in 112 individuals utilizing a food pantry in Central Texas. Participants were recruited randomly and interview-administered three questionnaires in English and Spanish. The questionnaires included demographics[94], a food frequency questionnaire (FFQ)[119], and a list of food donations. The FFQ quantified caloric and nutrient intake of the overall food consumption of clients for the previous month. A list that documented the specific food donations contained

questions about the nature, brand, quantity and frequency of obtaining the benefit. The reported descriptions of the donated foods were validated by the researcher who took photos of these foods using a Galaxy S5 phone.

Study Sample

A total of 112 adults from a food pantry that offered free food donations agreed to participate in this research. The nature of the study was explained to the participants, who then signed a consent form. Upon successful completion of the survey, clients were compensated by the sum of $10. The protocol of this study was approved by the Institutional Review Board at the University of Texas at Austin.

Instruments

Demographic Questionnaire contains 25 questions on: age, sex, ethnicity, weight, height, educational level, marital status, occupation, and socioeconomic status of the clients. This self-reported instrument was developed and validated in a previous study by the author [94]. All instruments were completed by paper and pencil.

Food Frequency Questionnaire (FFQ) estimates the monthly dietary intake in terms of regularity and quantity of food consumption. The author developed and tested this 195-item FFQ in 2004 in a sample of low-income women from Central Texas (Cronbach's $\alpha = 0.7$) [119]. The frequency of food consumption was discerned by the use of a 9-point likert scale, ranging between from <1 per month to 2+ times per day. The serving size was described as small, medium, large or extra large. This questionnaire was interviewer-

administered by the researcher and trained nutrition undergraduate students. Props were utilized to assist the participants in estimating the amount of food consumed; these included measuring cups and spoons, and images of foods/meals of a wide range of portion sizes.

List of food donations of food recipients provided verification of the nature (canned, bottled, fresh and/or frozen), brand and quantity (serving size) of foods, and frequency of visiting the food pantry. To assess the relative validity, these data were compared to photographs of the donated food, which the researcher took at the time of food distribution. Since the donations obtained were for a household, benefits for each client were calculated by dividing the total amount of donations by household size.

Nutrient intake of the base diet, food donations, and the total diet of the clients were measured via FoodWorks 8 Professional software. This software utilized the database of the USDA[120]. Adequacy of the nutritional content of the food was assessed by comparison to the Dietary Reference Intakes (DRIs) [66,117,121]. During analysis, values were estimated from related foods if nutrient information for any food item was lacking, this occurred for < 2% of the foods.

Choose MyPlate developed by the USDA, was the tool used to determine serving size equivalents for food groups. These categories were vegetables, fruits, refined and whole grains, milk and dairy products, beans and meat, and empty calories (solid fats, added sugars and alcohol)[122]. Quantities of servings of all these food groups also were estimated according to the 2015-2020 U.S. Dietary Guidelines [64].

Analysis of Statistics

Statistical analysis was based on a common software package, the Graduate Pack SPSS 19.0 for Windows 2010. Standard descriptive statistics were calculated, and are presented as mean ± standard error of the mean and frequency distributions. Average differences between base and total dietary intakes were assessed by paired sample t-tests. All two-tailed $P < 0.05$ were considered significant.

Results

Table 4.1 shows the characteristics of the food pantry clients. The average age was 51 years for adults, with their children ranging from 0.2 to 6 years old. Participants had a mean household size of three, and had lived in the U.S. for more than three-fourths of their lives.

The sample was tri-ethnic, with 23% non-Hispanic White, 40% Hispanic and 30% African American; and two-thirds were women. The average body mass index (BMI) was 28.98 kg/m^2, with 69% being overweight or obese. Approximately, 6% and 44% of the clients had finished junior high and high school, respectively as they spent an average of 11.88 years in school (**Table 4.1**). The majority of participants were unemployed. Only one person in our sample received a monthly Supplemental Security Income (SSI) of $900. Two thirds of the population lived below the poverty threshold of $11,880 per

person. Some clients (13.8%) were homeless, living in a car, van, trailer or shelter, or on the streets.

The type of food, amount and monthly value of a food donation box from a food pantry on a per client and household basis is shown in **Table 4.2**. This box was distributed every 2 weeks, and weighed an average of ≈ 36 kg per client and 101 kg for household. The monthly estimated worth was approximately $160/client and $457/household. The mean daily amount of the food obtained by each recipient was 2.5 kg (**Table 4.1**), which averaged 7 kg per household. The box included a large variety of food items such as fresh fruits and vegetables, dried and frozen fruits, juice, bakery products, milk, eggs and meat. All foods had to be removed from the box and consumed offsite. The clients described the donated food as filling and of high-quality. All participants shared this food with their families; while 20% of them also shared this donation with a neighbor, friend or relative.

Daily nutrient intakes of the base diet, food donations, and total diet, and percentage of DRI for the clients are presented in **Table 4.3**. Daily consumption of the base diet prior to receiving donations was 30% to 60% of the DRIs for carbohydrates, dietary fiber, fat soluble vitamins, vitamin C, P, Mg, Fe, Cu, Se and K [66]. However, after the donations, the mean total energy intake of individuals was 60 kcal greater than their calculated need, as assessed by their corresponding DRI (2,162 kcal). Also, the average total dietary intake was higher than their recommended DRIs [66,117,121] for protein, fat,

saturated fatty acids, cholesterol, B-vitamins, P, Zn, Cu, manganese (Mn), Se and Na ($P < 0.05$).

Table 4.3 shows that the food benefits provided more than 55.7% of the energy consumed, as well as 61% of carbohydrate, 51.5% of protein, 52% of fat, 58% of saturated fatty acids, and 53% of dietary fiber on a daily basis. Furthermore, the food donations supplemented total dietary intake with additional amounts of vitamins D, C, B_2, B_6 and B_{12}, Mg, Fe, Zn, Se, K (> 40%), P and Cu (> 60%).

Yet, the base diet did not meet the DRIs for energy, carbohydrates, protein, fat, dietary fiber, fat and water soluble vitamins and minerals. Exceptions were for vitamin B_{12} and Na, which were 4.6% and 67.5% above the DRI. But the food benefits added to the base diet contributed a wide range of essential nutrients, ranging from 10 to 110% of the DRIs (**Figure 4.1**). Nutrients of the food donations that were > 40% of the DRI were energy, macronutrients, dietary fiber, vitamins C, B_2, B_6 and B_{12}, Fe, Zn, Na, P, Cu and Se [66,117,121].

Figure 4.2 shows mean servings of food groups provided by food donations and total dietary intake and food donations. Daily intake of participants almost met the 2015 U.S. Dietary Guidelines for refined grains, fruits, vegetables, and meat. But their diet remained lacking in the whole grains (25%) and dairy (74%) food groups [64]. Clients consumed large quantities of high fat foods in their total diet, in which about half of their caloric intake was empty calories (calories from added sugars, solid fats and alcohol). Moreover, the total diet was supplemented by the food donations for more than half of

the portions of refined and whole grains, fruits, vegetables, dairy products, protein foods and meat but the food donation did not contain many low-fat foods. Thus, before the addition of food donations, the base diet did not comply with 2015 U.S. Dietary Guidelines [64].

Discussion

These results showed that the addition of food donations to the diet of this low-income sample greatly increased their total nutrient intakes [66,117,121]. After obtaining the donations, the daily amounts for energy, protein and fat exceeded their corresponding DRIs. Whether the additional 60 kcal of daily energy intake above the DRI would promote weight gain over the long term is unclear. No significance was seen in the relationship between energy intake and BMI, but this could be due to limited variance of BMI, as 69% of the participants were overweight or obese.

Prior to receiving the donated food, the base diet was 40% to 70% below the DRI recommendations for energy, carbohydrate, dietary fiber, fat soluble vitamins, vitamin C, as well as the minerals P, Mg, Fe, Cu, Se and K [66,117,121]. The addition of food donations mitigated these inadequacies substantially, with the exception of the fat-soluble vitamins, folate, Ca, Mg and K (< 30% of DRI).

Table 4.1. Characteristics of participants receiving food donations from a food pantry (n = 112)

Characteristic	Mean ± SEM	Range
Age, yrs		
Client	50.91 ± 1.17	20 - 81
Children	3.62 ± 0.49	0.2 - 17
Household size		
2 mo - 18 yrs	1.13 ± 0.15	0 - 6
> 18 yrs	2.19 ± 0.13	1 - 8
Total	3.41 ± 0.20	1 - 9
Residence in United States, yrs	39.12 ± 2.18	1 - 81
Body mass index, kg/m^2	28.98 ± 0.60	17.1 - 56.61
Annual income, $	11,890.32 ± 1,416.09	0 - 60,000
Education, yrs	11.88 ± 0.34	6 - 21
Daily amount of food donation per client, kg	2.53 ± 0.001	2.49 – 2.53

Table 4.2. The type, amount and monthly value of foods in a food donation box on a per client basis provided by a food pantry [*]

	Per client		Per household	
Type of food in food donation	**Amount**	**Monthly value, $**	**Amount**	**Monthly value, $**
Fruits				
Fresh, Apples	0.9 kg	6	2.6 kg	16.9
Dried, Cranberries	0.7 kg	12	1.9 kg	33.9
Frozen, Cherries	1.8 kg	40	5.1 kg	113.2
Canned, Cranberries	0.4 kg	3	11.3 kg	8.5
Juice, Grape				
Container	3.8 L	8	10.8 L	22.6
Bottles, 6	0.4 L/bottle	10	1.1 L/bottle	28.3
Fresh vegetables				
Brussel sprouts	0.9 kg	12	2.5 kg	33.9
Spinach	0.3 kg	2.6	0.9 kg	7.4
Bread, Whole wheat	0.7 kg	7	1.9 kg	19.8
Bagels, White/Whole wheat	0.7 kg	10	1.9 kg	28.3
Pasta	0.5 kg	2.8	1.4 kg	7.9
Milk	0.9 L	6	2.5 L	16.9
Eggs	24 eggs	6	67.9 eggs	16.9
Meat, Beef steak	2.7 kg	36	7.6 kg	101.9
Total	35.7 kg	161.4	101 kg	456.8

[*] Food donation is offered to clients twice a month.

Table 4.3. Daily nutrient intakes of base diet, food donations, and total diet, and percentage of Dietary Reference Intakes (DRI) for clients of a food pantry (n = 112)

Nutrient	Base diet	Food donations	Total diet	Total diet proportion of DRI
	← Mean ± SEM →			← % →
Energy, Kcal	1099.79 ± 65.86 [a]	1122.33 ± 0.19	2222.12 ± 66.24 [b]	102.8
Carbohydrate, g	126.67 ± 8.83 [a]	151.85 ± 0.05	278.52 ± 8.94 [b]	93.72
Protein, g	51.38 ± 3.09 [a]	42.64 ± 0.11	94.02 ± 3.16 [b]	150.24
Fat, g	45.61 ± 2.90 [a]	38.29 ± 0.05	83.90 ± 3.01 [b]	124.78
Fatty Acids, g				
Saturated	13.46 ± 0.94 [a]	13.64 ± 0.02	27.10 ± 1.01 [b]	120.66
Mono-unsaturated	15.19 ± 0.97 [a]	8.87 ± 0.02	24.06 ± 0.98 [b]	100.21
Poly-unsaturated	6.68 ± 0.33 [a]	2.99 ± 0.01	9.67 ± 0.38 [a]	44.79
Trans	0.82 ± 0.07 [a]	0.08 ± 0.003	0.90 ± 0.08 [a]	_
Cholesterol (mg)	220.81 ± 13.15 [a]	109.66 ± 0.03	330.47 ± 13.16 [b]	110.16
Omega 3, g	0.73 ± 0.05 [a]	0.19 ± 0.001	0.92 ± 0.04 [a]	_
Omega 6, g	5.04 ± 0.27 [a]	2.70 ± 0.002	7.74 ± 0.31 [a]	_
Dietary Fiber, g	15.86 ± 1.31 [a]	11.88 ± 0.01	27.74 ± 1.27 [b]	91.67
Total Sugars, g	65.80 ± 4.86 [a]	40.86 ± 0.06	106.66 ± 5.06 [b]	_
Added	9.89 ± 0.74 [a]	7.96 ± 0.05	17.85 ± 0.83 [a]	_
Vitamin A, µg	482.21 ± 16.78 [a]	148.32 ± 0.04	630.53 ± 16.87 [b]	81.36
Vitamin D, µg	2.28 ± 0.11 [a]	1.37 ± 0.01	3.65 ± 0.13 [a]	73.00
Vitamin E, mg	5.67 ± 0.33 [a]	1.68 ± 0.02	7.35 ± 0.33 [a]	49.00
Vitamin K, µg	68.13 ± 1.31 [a]	30.64 ± 0.15	98.77 ± 1.54 [b]	97.55

Table 4.3. Continued

Nutrient	Base diet	Food donations	Total diet	Total diet proportion of DRI
	← Mean ± SEM →			← % →
Vitamin C, mg	38.23 ± 1.26 [a]	40.1 ± 0.02	78.33 ± 1.35 [b]	97.15
Thiamin, mg	1.10 ± 0.04 [a]	0.44 ± 0.01	1.54 ± 0.04 [a]	128.33
Riboflavin, mg	1.01 ± 0.02 [a]	0.75 ± 0.06	1.76 ± 0.05 [a]	135.38
Niacin, mg	12.22 ± 0.43 [a]	5.31 ± 0.01	17.53 ± 0.46 [b]	109.56
Vitamin B_6, mg	0.88 ± 0.02 [a]	1.01 ± 0.01	1.89 ± 0.05 [a]	145.38
Folate, µg	373.68 ± 14.17 [a]	86.36 ± 0.04	460.04 ± 14.26 [b]	115.01
Vitamin B_{12}, µg	2.51 ± 0.07 [a]	1.55 ± 0.01	4.06 ± 0.09 [b]	169.17
Calcium, mg	627.86 ± 28.95 [a]	224.16 ± 0.03	852.02 ± 28.99 [b]	85.20
Phosphorus, mg	306.23 ± 25.95 [a]	766.33 ± 0.04	1072.56 ± 26.04 [b]	153.22
Magnesium, mg	150.63 ± 6.24 [a]	101.99 ± 0.04	252.62 ± 6.31 [b]	70.66
Iron, mg	7.74 ± 0.31 [a]	6.23 ± 0.03	13.97 ± 0.33 [b]	98.04
Zinc, mg	5.03 ± 0.24 [a]	5.21 ± 0.02	10.24 ± 0.26 [b]	112.16
Copper, µg	303.25 ± 6.39 [a]	653.88 ± 0.09	957.13 ± 6.49 [b]	106.35
Manganese, mg	1.51 ± 0.03 [a]	0.59 ± 0.002	2.1 ± 0.02 [a]	105.53
Selenium, µg	32.3 ± 2.52 [a]	52.77 ± 0.02	85.07 ± 2.55 [b]	154.67
Sodium, mg	2651.17 ± 113.3 [a]	624.09 ± 0.04	3275.26 ± 113.4 [b]	214.14
Potassium, mg	1394.28 ± 72.29 [a]	1375.96 ± 0.04	2770.24 ± 72.32 [b]	58.94

[a,b] Different superscripts indicate significant differences in rows at $P \leq 0.05$.

Figure 4.1. Percentage of daily contribution of the food donations to total nutrient intake recommended by the Dietary Reference Intakes (DRI) [66,117,121] of food pantry clients (n = 112)

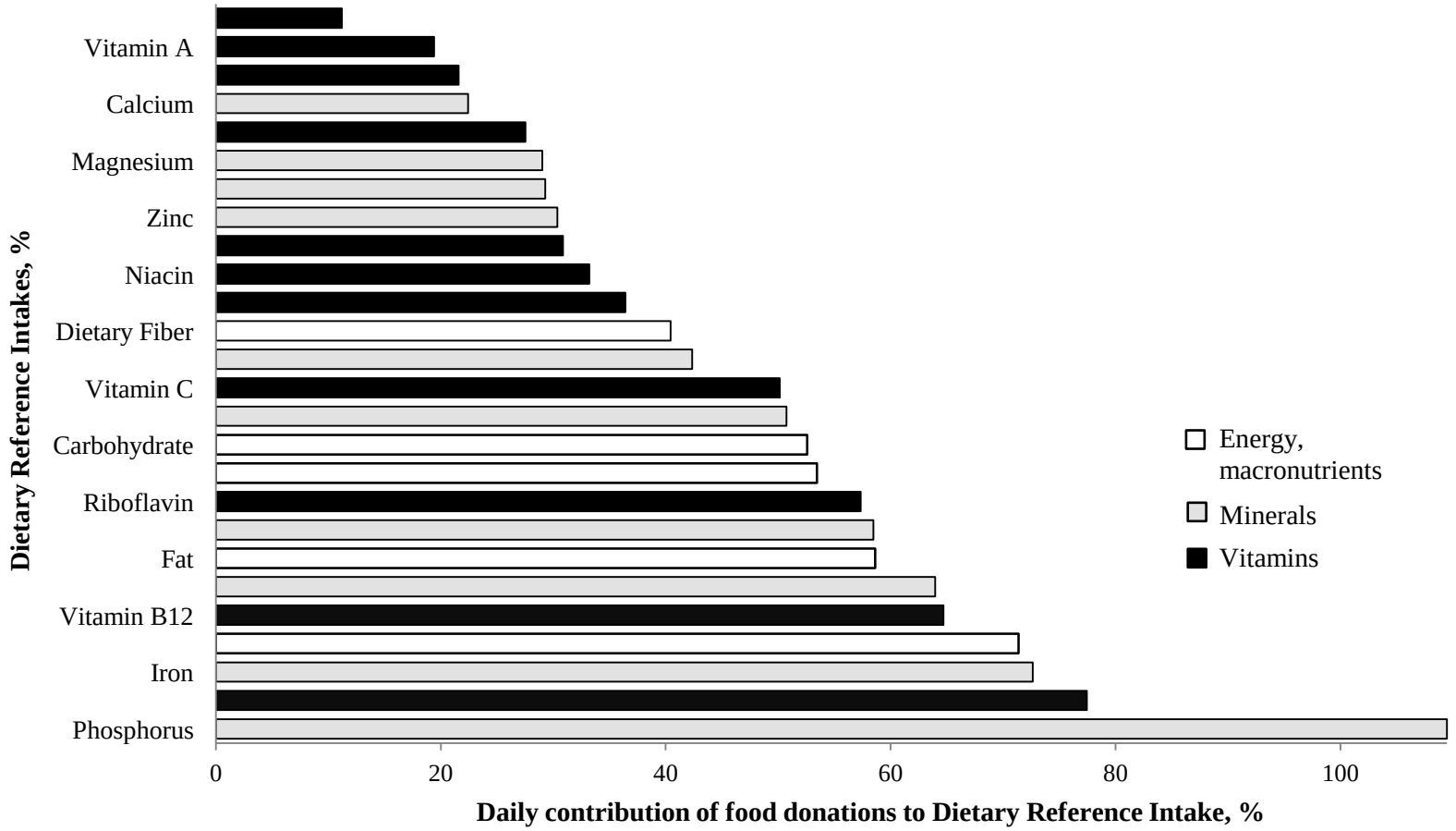


Figure 4.2. Servings of food groups provided by food donations and total dietary intake according to the 2015-2020 Dietary Guidelines for Americans for clients of a food pantry (n = 112)

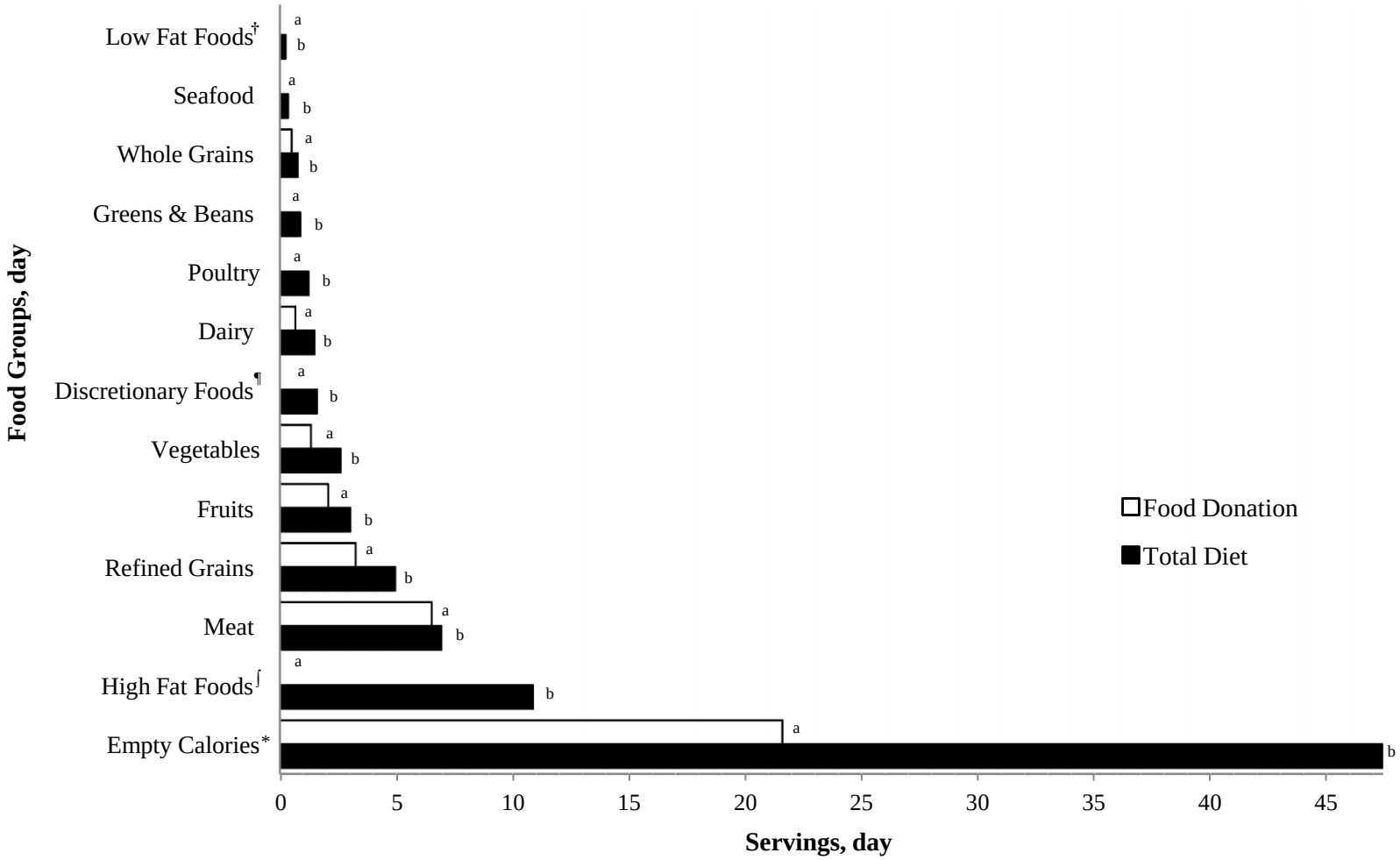


Figure 4.2. Continued

[a,b] Different superscripts indicate significant differences in rows at $P \leq 0.05$
† Low fat foods include low-fat ice-cream, yogurt or mayonnaise.
¶ Discretionary Foods consist of foods containing added sugars such as sugar-sweetened beverages..
∫ High fat foods include burrito, chicken nuggets or full fat mayonnaise.
* Empty calories includes calories from added sugars, solid fats and alcohol; calculated as [added sugars (grams) + saturated fatty acids (grams) + alcohol (grams)] per 1000 kcal consumed per day.

In 2004, Akobundu et al. [123] evaluated the nutritional content of donations of 19 clients obtaining food from food pantries in Massachusetts. In terms of nutrition density, adequate proportions of protein, dietary fiber, folate and Fe were observed for each individual; but this was not true for vitamins A and C, and Ca. Greger et al. [124] also found that the donated foods of two pantries in Wisconsin supplied each client with an average of 1,942 kcal, 67 g protein, 584 µg folate, 61 mg vitamin C, 744 µg vitamin A, 336 mg Ca, and 23 mg Fe. The estimates of nutrients provided by the food donation in the present research are lower than that reported by these previous studies.

Numerous investigations conducted in Canada[60,125-130], Netherlands[73], Germany[131] and the United Kingdom [132] observed similar findings regarding nutrient content of food bags provided to the low-income. These food boxes supplemented each food recipient with varying amounts of nutrients that were larger than that provided by the food donation in the current project. Variations in results could be due to the characteristics of the population sample, types and quantities of donated foods, and methods of evaluation. For example, most researchers assessed food intake using 24-hour dietary recalls [127-129, 133], or solely analyzed the food bags [60,73,124-126,130,132]. Yet none of these studies have looked at the contribution of the food donations to the total diet.

In our study, total daily food intake of the participants exceeded or almost met recommendations for the 2015 U.S. Dietary Guidelines for all food groups, with the exception of whole grains and dairy foods [64]. The participants consumed large amounts of high fat foods and added sugars due to the inclusion of fast foods and sugar-sweetened

beverages in their base diets. Remarkably, the food donation supplemented the total diet with more than half of their daily portions of refined and whole grains, fruits, vegetables, dairy foods and meat. The continued low intake of whole grains and dairy products, even with food donations, may have been due to the clients' refusal of whole grain bakery products or milk when offered. When queried the reason for the refusal of free food, they reported that they did not take the whole grain free products or milk because their children did not like to eat whole grain bread or the household lacked a refrigerator to store milk.

In Rhode Island, a survey documented dietary intake of 197 men and women who obtained benefits from SNAP, shelters, food pantries and/or soup kitchens. The daily dietary intake of each food recipient included 1.3, 1.1, 2.2, 3, 8 and 74 portions of fruits, dairy foods, meat/beans, vegetables, grains and fat, respectively. Consumption of the first four food groups was lower than recommended, yet the quantity of fat group (74 servings) ingested was enormous. These authors concluded that these high quantities of these foods could have an unfavorable effect on weight, as more than two thirds of the sample were overweight or obese [133]. This finding is similar to our study in which excess intakes of energy, protein and fat were observed after the addition of the food benefits, also over two-thirds of our participants were overweight or obese. Yet no direct correlation of weight to energy intake was seen in our research.

In our study, the donations offered by a food pantry contained a wide variety of foods that satisfied their appetites. Others have reported similar findings, in which food

bags contained packaged, canned, frozen and fresh foods such as fruits, vegetables, bread, pasta/noodles, tortilla, eggs, dairy and meat products, coffee, tea and/or sweets[74,134-136]. But none of these have reported the extent of the contribution of the food benefit to the total diet. In this study, the nutritional status of the food recipients was substantially improved by food donations, with the exceptions of vitamin A, folate and Mn. The greatest increase was for P, presumably due to its high concentration in meat, milk, bakery products and pasta.

In Oregon, Hoistington et al. [137] documented foods offered by a food bank. Two thirds of the donations were fresh produce, and one third included: canned or boxed foods (11%), discretionary (8%), condiments (7%), and noodles (8%) [137]. In comparison, our food box contained less fresh produce (28.6%), and more boxed (42.9%), bottled (21.4%) or canned foods (0.5%). But our food box did not contain any discretionary foods or condiments. Furthermore, the food donations added grains, vegetables, meat and beans (~ 10 servings/each group), fruits and dairy foods (~ 6 servings/each food category) to the diet [137]. Our food donation however, provided lower portions of these food groups; 3.75 grains, 1.33 vegetables, 6.52 meat and beans, 2.07 fruits and 0.66 dairy products.

In 2004, the donations of food pantries in the Brown Bag for Elder program in Massachusetts were observed to meet the recommendations in the (1992 Food Guide Pyramid). The donations provided each client with daily servings of grains (6), fruits (2), vegetables (3), meat and its products (2), milk and dairy foods (2), and fats, oils and sweets (10) [123]. Compared with the outcomes of this study, our sample consumed similar

portions of grains (3.75), but higher amounts of fruits (2.07) and meat (6.52) and lower quantities of vegetables (1.33) and dairy products (0.66).

Limitations of this research are possible measurement errors for the FFQ [131,138], over- or under-estimates of quantities of foods donated by the food pantry and the self reported weights and heights. Strengths of this study are the use of visual props to help discern the portion size, a smart phone to document the type and size of food donations, and the FFQ for evaluation of dietary intake over a 1 month period.

Conclusions

This is the first study to measure the relative value of the nutrients contributed by food donations to the total dietary intake of the recipients. The food donation substantially improved the nutrient status of the population, such that amounts of energy and the energy nutrients exceeded the DRIs. Whether this greater intake of energy would increase overweight over the long term is unclear. In our research, the two food groups that were lacking were whole grains and dairy foods. This may be due to the refusal of the client to take the offered whole grain bakery products and/or milk. This package of food could have been improved by incorporation of more of these foods; but the budget and physical constraints of the organization may preclude their addition. A nutrition education effort at the site to emphasize the health benefits of these foods would be helpful.

Dietitians, nutritionists and health professionals should be encouraged to volunteer to participate in organizations that provide food donations, as these are an important asset for improving the health of the community.

CHAPTER 5. IMPACT OF FOOD RESCUE NUTRITION ON DIET QUALITY OF CLIENTS UTILIZING SOUP KITCHENS

Abstract

Background: In the U.S., approximately 47 million individuals are classified as low-income. This lack of financial resources may limit the availability and consumption of healthy foods, leading to diminished diet quality. One option for this population to obtain additional foods is a soup kitchen.

Objective: The objective of this study was to assess the impact of a meal donation on the total diet quality of the clients.

Design: A total of 110 individuals (≥ 18 years) were selected randomly from a soup kitchen in Central Texas. This cross-sectional study was conducted in September 2015. Clients completed a demographic questionnaire, food frequency questionnaire and a list of food donations. Diet quality and food servings of the original diet, meal donation and total dietary intake were estimated for participants via both the HEI-2010 and 2015 U.S. Dietary Guidelines.

Results: The soup kitchen provided a daily meal, which had to be eaten at the same location. This simple meal included a variety of food (fruit, cheese, egg, and bagel) but did not contain any vegetables or meat. Mean diet quality for their original diet was modest (HEI-2010 = 55.25). The extra meal donated by the soup kitchen increased the

diet quality of the total diet by 10%, and added fat-soluble vitamins and essential minerals.

Conclusions: The meals offered at the soup kitchen may be not be a soup or hot, but these foods slightly improved the diet quality of the clients. Health professionals should recognize and support these soup kitchens for their impact on improving nutritional status of the low-income and homeless in their communities.

Introduction

In the U.S., approximately 47 million individuals are classified as low-income [140], and 7.4% of this population lives below 100% of the poverty rate (< $12,000 per capita)[2]. This lack of financial resources may limit the availability and consumption of healthy foods, leading to diminished diet quality [58].

A number of government food assistance programs have been created to provide food benefits to those in need, including WIC, Head Start and Meals on Wheels (for elderly) [24]. But private non-government programs also have been developed to provide food, such as community and religious organizations, food pantries and soup kitchens [41] [141]. This project will focus on the impact of meals of soup kitchens on the diet quality of a low-income population.

Several nutritional assessment studies have been conducted in soup kitchen populations. In 2010, Smith et al. [142] examined nutritional status of 254 women who

resided in shelters and "food deserts" in Minnesota. The meals contained daily serving of fruits (< 2), dairy foods (< 2) and meat (< 2.5) that were lower than that of the U.S. Dietary Guidelines. In Nevada, diets of 191 users of emergency programs including food pantries and soup kitchens were evaluated by 24-hour dietary recall. Total energy intakes were inadequate, as they averaged < 1200 kcal. Also lower levels than the DRIs were documented for thiamin (72%), riboflavin (67%), niacin (59%), vitamins A (70%) and C (73%), Fe (59%), and Ca (76%) [66,117,143]. A similar study in Canada also reported that the meal offered at the soup kitchen provided 2.6 servings of grains, 4.1 servings of fruits and vegetables, 0.4 serving of dairy foods, and 1.7 servings of meat [65]; these quantities are less than the recommended Dietary Guidelines for Americans (6, 5, 2 and 2.5 portions, respectively [64]). Nonetheless, these donations are believed to improve the diet of the clients of these charitable agencies.

The present research hypothesized that soup kitchen meals would have a substantial effect on the nutritional status of their clients. The effect of the meals of a soup kitchen on the total diet quality of participants has not been explored to date, which is the objective of this study.

Materials and Methods

Design

A total of 110 clients (≥ 18 years) were selected randomly from a soup kitchen in Central Texas in September 2015 for a cross-sectional study. Study participants were interview-administered a demographic questionnaire [94], food frequency questionnaire (FFQ) [119], and a list to document food donations. Instruments were provided in English and Spanish, and completed by paper and pencil. The demographics obtained information about age, sex, ethnicity, anthropometrics and socioeconomic data. The FFQ measured the monthly energy and dietary intake of the total diet of clients. The list of food donations documented the frequency of receiving the meals, and their type and amount; these quantities were validated by the researcher who took photographs via a smart phone.

Study Participants

A total of 110 clients of a soup kitchen who received free meals were enrolled. The protocol of the study was explained to the participants, and a consent form was obtained. Study participants were compensated by $10 upon successful completion of the questionnaires. This study was approved by the Institutional Review Board at the University of Texas at Austin.

Tools of Assessment

Demographic Questionnaire is a 25-item tool created by the author. It collected self-reported information about: age, sex, ethnicity, weight and height, educational level, marital status, occupation, and socioeconomic status of the clients [94].

Food Frequency Questionnaire (FFQ) is a 195-item scale developed and validated by the author in low-income women recruited from Central Texas in 2004 (Cronbach's α = 0.69) [119]. This FFQ measured the frequency and amount of dietary intake over a period of one month. The portion size was estimated as small, medium, large or extra large; and a 9-point likert scale of frequency of food consumption ranged between never or <1 per month to 2+ times per day. The researcher and trained nutrition undergraduate students administered the FFQ, and used photographs of various portion sizes of foods/meals, and measuring cups and spoons to assist in estimation of portion size.

List of food donations of recipients collected descriptive information about the frequency of receiving the meal, its type (fresh, cooked and/or packaged) and amount (quantity or portion size). Validity of this list was evaluated by comparing the data collected from the participants with the photographs of the free meal, as captured via a smart phone.

Dietary Intake was estimated for all participants via FoodWorks 8 Professional software. This software is based on the USDA database [120]. The dietary values of foods were compared with the corresponding Dietary Reference Intakes (DRIs) of energy,

macro- 121 and micro-nutrients [66,117,121]. In the case of missing nutrient data for any food during dietary analysis, the nutrient intake was extrapolated from values of closely related foods; this method was used for < 1% of food items.

Choose MyPlate was established by the USDA and used to estimate portion size equivalents for each food group based on daily recommended intakes of foods were derived from the 2015-2020 Dietary Guidelines for Americans [64]. Food groups utilized included fruits, vegetables, beans, grains (refined and whole), dairy and protein foods (plant proteins, poultry, meat, and seafood), solid fats and added sugars [64,122].

Healthy Eating Index-2010 was calculated to measure the quality of the original diet, meal donation and total dietary intake [144]. The HEI-2010 describes adherence of food groups consumed with the Dietary Guidelines for Americans, in terms of adequacy and moderation. The scale ranges from 0-100 points, in which higher scores reflect greater compliance with the guidelines. This index consists of 12 items; nine groups measure adequacy (total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy and total protein foods, seafood and plant proteins, and fatty acids), and the other three evaluate moderation (refined grains, sodium, and empty calories) (Cronbach's alpha = 0.68) [137].

Analysis of Statistics

Statistical analyses were conducted using the Graduate Pack SPSS 19.0 for Windows 2010. Descriptive statistics were performed and presented as mean ± standard

error of the mean (SEM) and frequency distributions. Paired sample t-tests were used to estimate mean differences for diet quality and food servings between the original diet and the total diet. All two-tailed $P < 0.05$ were considered significant.

Results

General characteristics of the population sample are presented in **Table 5.1**. The soup kitchen clients were adults, age 21 to 78 years, with a mean body mass index of 26 kg/m^2. Less than half of the participants were overweight or obese (46%). The mean annual income of the clients was $3,878. Only 16% were employed, 66% did not have any income and 93% lived below the poverty level ($11,880 per person). Moreover, only 9% of the clients received a monthly supplemental social income (SSI), averaging $433.90/month (**Figure 5.1**). These SSI benefits were only 6.4% of the mean total annual income of the group, $3,878. Participants averaged 14 years of education (**Table 5.1**), did not report having any children or others living in their households and only 23% were married.

Most of the recipients were men (70%); and total participants were Non-Hispanic Whites (51%), Hispanics (15%) and African Americans (28%). In our sample, 95% reported that they were homeless: living in cars, trailers, shelters (53%) or on the streets (43%). Only 50% had finished high school and 45% drank alcohol, primarily beer (78%). Moreover, the majority of them were smokers (73%), and physically active (82%), but

suffered from a health problem (78%) such as heart disease, type-2 diabetes, arthritis and depression.

Clients of the soup kitchen received a modest daily meal, weighing ≈ 400 g per client as seen in **Table 5.2**. The monetary value of the free meal was estimated to be slightly over $4. The meal was required to be consumed at the same location, and included a piece of fruit, bakery products, egg cheese, and coffee. Of these, the bagel provided the highest quantities of energy, carbohydrates and protein; cheddar cheese contained the greatest amount of fat. More than one third of food recipients reported that the meal did not satisfy their hunger; however, most of them considered the meal to be very good (88%).

Table 5.3 describes the mean servings of food groups in the original diet, meal donation and total diet, as well as the HEI-2010 scores for clients. Total food consumption of participants almost met the 2015 U.S. Dietary Guidelines 64 for grains, refined grains, fruits, and protein foods. However, the total diet was lacking in whole grains, vegetables and dairy foods. The soup kitchen meal provided the total diet with more than half of the portions of refined and whole grains, fruits, dairy products and meat (i.e., eggs) and 13% of empty calories.

Participants scored above the cut-off point of the HEI-2010 for total proteins (score = 5), and refined grains (score = 10), and high for empty calories (score = 20) in which higher scores reflect better diet quality. This is believed to be due to low to moderate intakes of protein foods, refined grains and foods that are high in fat and/or

sugar. In contrast, the clients had low scores for whole grains, dairy foods, fatty acids and Na (score = 10); total and whole fruits, total vegetables, greens and beans, and seafood and plant proteins (score = 5). This poor diet quality of the total diet (with the exception of lack of empty calories) might be due to the inadequate consumption of energy (1919 kcal/day). Total diet quality was modest, with the mean HEI-2010 score of the original diet being 55. This HEI-2010 score improved to 61 with the meal donation. Thus, the soup kitchen meal improved the diet quality of the original diet by ~ 10% (**Table 5.3**).

The meal provided 616 kcal which consisted of 51% of carbohydrates, followed by fat (33.9%) and protein (17%). Moreover, carbohydrates, fat, protein and dietary fiber of the meal provided 25%, 32%, 44% and 41% of their DRIs, respectively [121]. The contribution of carbohydrates, protein, fat and dietary fiber from the additional meal to the total diet was 38% for carbohydrates, 44% for protein, 45% for fat and 64% for dietary fiber.

Figure 5.2 shows the percentage of contribution of micronutrients of the meal to the total diet of soup kitchen clients. The soup kitchen meal increased the total dietary intake by more than 40% of vitamins A and D, and riboflavin, as well as trace minerals, Cu, P and Mg. The vitamin C contribution from the meal was the lowest of all nutrients added, only 14.4%.

Table 5.1. Characteristics of clients of a soup kitchen (n = 110)

Characteristic	**Mean ± SEM**	**Range**
Age, yrs	45.45 ± 1.14	21 - 78
Body mass index, kg/m^2	25.98 ± 0.55	16.61 - 51.88
Yearly income, $	3,878 ± 800	0 - 30,000
Annual Supplemental Security Income, $ [a]	433.92 ± 181.2	0 - 10800
Years of education, yrs	13.54 ± 0.33	6 - 22

[a] Supplemental security income is provided by the Social Security Administration of the United States government.

Table 5.2. Sample of a meal from a soup kitchen

Food Item	Amount	Energy, Kcal	Carbohydrate, g	Protein, g	Fat, g
Apple/Orange	1	80	19	1	0
Flour tortilla	1	58	12	1	1
White/Whole wheat bagel	1	260	52	11	1.5
Egg (hard-cooked)	1 large	77.5	0.6	6.3	5.3
Cream cheese	28.3 g	49.6	0.6	0.87	4.9
Cheddar cheese	28.3 g	111.4	1	7.1	9.1
Coffee	1 cup	2.4	0	0.3	0
Total, g	360	638.9	85.2	27.6	21.8
Estimated cost, $	4.30	_	_	_	_

Table 5.3. Servings of food groups in original diet, meal donation and total diet, and Healthy Eating Index-2010 (HEI-2010) scores of diets of clients of a soup kitchen (n = 110)

	Original diet		+ Meal donation	= Total diet	
Food Group	**Serving/d**	**HEI-score**	**Serving/d**	**Serving/d**	**HEI-score**
	← Mean ± SEM →				
Adequacy					
Total fruits [a]	0.78 ± 0.17 [h]	2.44 ± 0.05 [j]	1.66 ± 0.02	2.44 ± 0.19 [g]	4.78 ± 0.05 [i]
Whole	0.52 ± 0.13 [h]	3.25 ± 0.13 [j]	1.11 ± 0.01	1.63 ± 0.13 [g]	5.0 ± 0.00 [i]
Total vegetables [a]	1.83 ± 0.15 [g]	3.32 ± 0.14 [i]	0.00 ± 0.00	1.83 ± 0.15 [g]	3.32 ± 0.14 [i]
Greens and beans [a]	0.59 ± 0.07 [g]	4.54 ±0.11 [i]	0.00 ± 0.00	0.59 ± 0.07 [g]	4.54 ± 0.11 [i]
Whole grains	0.07 ± 0.02 [h]	0.23 ± 0.09 [j]	0.50 ± 0.00	0.57 ± 0.02 [g]	2.14 ± 0.09 [i]
Dairy [a]	0.73 ± 0.08 [h]	0.36 ± 0.19 [j]	0.48 ± 0.02	1.21 ± 0.10 [g]	4.54 ± 0.24 [i]
Total protein foods	5.57 ± 0.31 [h]	5.57± 0.14 [j]	1.09 ± 0.03	6.66 ± 0.39 [g]	4.65 ± 0.08 [i]
Sea food and plant	0.79 ± 0.05 [g]	2.47 ± 0.17 [j]	0.00 ± 0.00	0.79 ± 0.05 [g]	3.62 ± 0.17 [i]
Proteins					
Fatty acids, g [b]	_	1.03 ± 0.16 [i]	_	_	1.03 ± 0.16 [i]
Moderation					
Refined grains	2.71 ± 0.26 [h]	7.53± 0.29 [i]	2.79 ± 0.02	5.50 ± 0.28 [g]	5.05 ± 0.29 [i]
Sodium	_	5.69 ± 0.29 [i]	_	_	5.44 ± 0.29 [i]
Empty calories, g [c]	31.95 ± 2.01 [h]	18.82 ± 0.46 [j]	13.43 ± 0.10	45.73 ± 2.11 [g]	16.48 ± 0.38 [i]
Total [d]	_	55.25 ± 0.69 [j]	_	_	60.58 ± 0.68 [i]

Table 5.3. Continued

	Original diet		+ Meal donation	= Total diet	
Food Group	**Serving/d**	**HEI-score**	**Serving/d**	**Serving/d**	**HEI-score**
	←		**Mean ± SEM**	→	
Total grains	2.79 ± 0.27 [h]	_	3.29 ± 0.02	6.08 ± 0.29 [g]	_
Meat	2.17 ± 0.14 [h]	_	1.09 ± 0.03 [k]	3.26 ± 0.17 [g]	_
Poultry	1.78 ± 0.13 [g]	_	0.00 ± 0.00	1.78 ± 0.13 [g]	_
Sea Food	0.43 ± 0.05 [g]	_	0.00 ± 0.00	0.43 ± 0.05 [g]	_
Discretionary foods	1.89 ± 0.10 [g]	_	0.00 ± 0.00	1.89 ± 0.10 [g]	_
Fat in foods					
High [e]	7.87 ± 0.43 [g]	_	0.00 ± 0.00	7.87 ± 0.43 [g]	_
Low [f]	0.20 ± 0.04 [g]	_	0.00 ± 0.00	0.20 ± 0.04 [g]	_

[a] Cup.
[b] Fatty acids = (Poly-unsaturated fatty acids + Mono-unsaturated fatty acids)/Saturated fatty acids.
[c] Empty calories = [added sugars (grams) + saturated fatty acids (grams) + alcohol (grams)] per 1000 kcal.
[d] Range of total HEI-2010 score is 0 - 100; a higher score reflects greater diet quality.
[e] Burrito; chicken nuggets; full fat mayonnaise.
[f] Low-fat ice-cream, yogurt or mayonnaise.
[gh] Different superscripts indicate significant differences for servings between overall and total diets at $P \leq 0.05$.
[ij] Different superscripts indicate significant differences for HEI-scores between overall and total diets at $P \leq 0.05$.
[k] The meat group of the meal is the egg.

Figure 5.1. Clients of a soup kitchen receiving Supplemental Security Income (SSI) (n = 110)

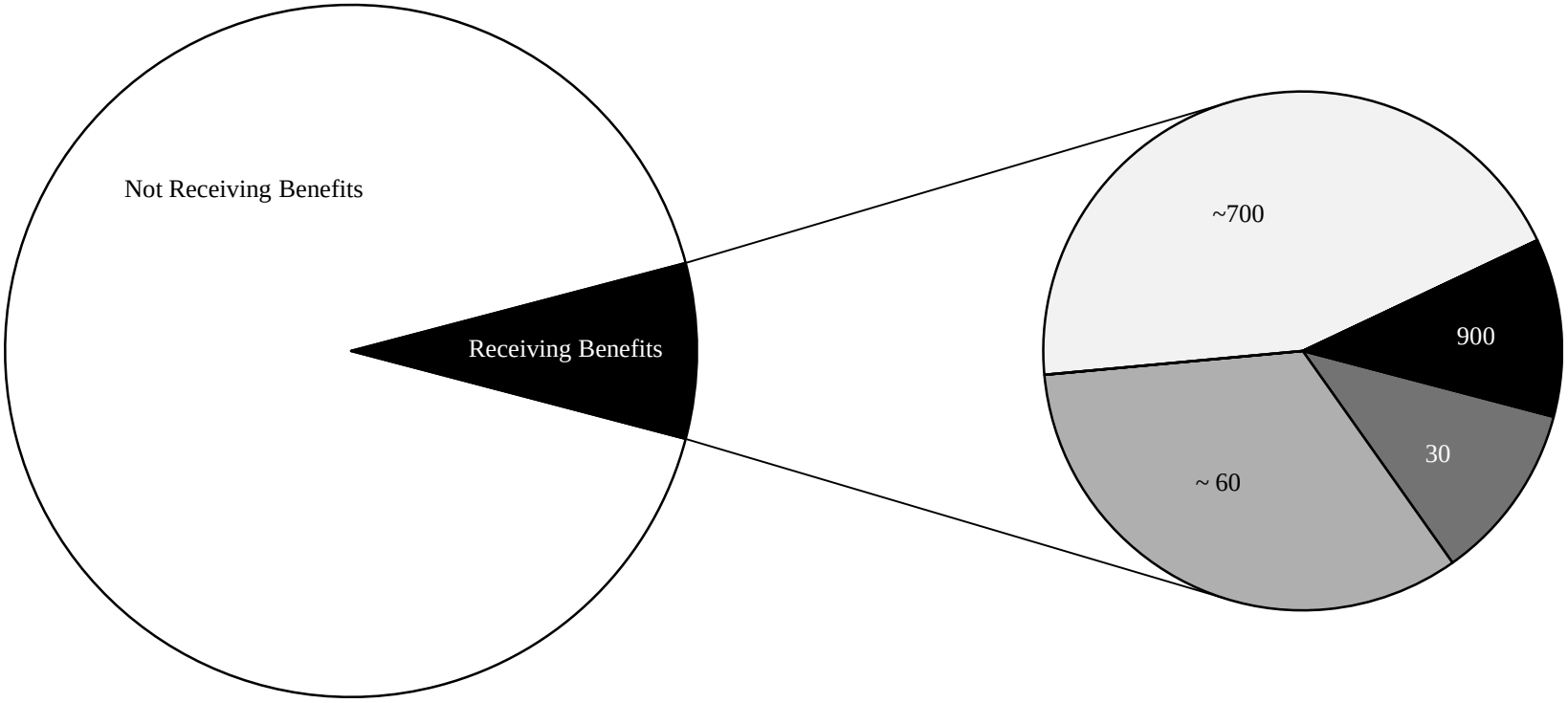
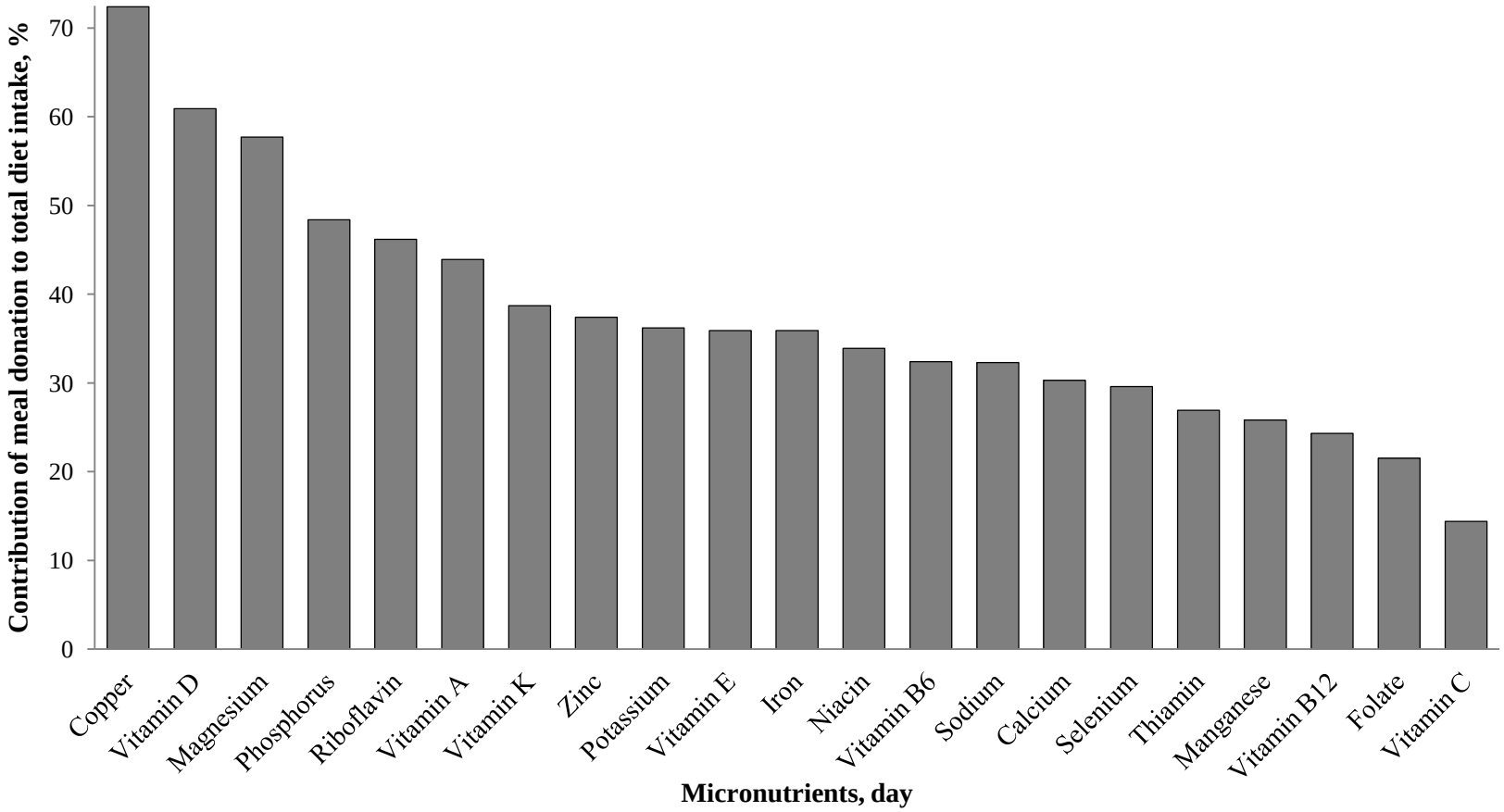


Figure 5.2. Percentage of contribution of micronutrients of the meal donation to the total diet of clients of a soup kitchen (n = 110)



Compared with the DRIs, the meal provided < 30% of the reference intakes of the vitamins, with the exception of riboflavin [66,117]. Minerals that were not provided at this 30% level were calcium (Ca), Mg, potassium (K), zinc (Zn), manganese (Mn) and selenium (Se) intakes [66]. The only nutrients of the meal that contributed > 50% to the respective DRIs were P and Cu [66,121].

Discussion

This study observed that clients of the soup kitchen were almost all homeless and quite poverty-stricken. Only 9% of the sample reported receiving a social supplemental income. Most of the participants did not receive a SSI presumably because of age (< 65 years), residence in shelters, and/or not having a taxable income due to lack of employment. It should be noted that the majority of clients reported lack of knowledge about the presence of public food assistance programs such as SNAP. Others indicated encountering some challenges including being convicted, and/or not being a citizen (the eligibility criteria to enroll in government assistance programs) [146].

The meal offered by the soup kitchen was not, nor did it include, soup. Rather the meal provided a variety of other food groups, with exception of a lack of vegetables. Nonetheless, the meal enhanced the total nutrient intake of their original diet and satisfied appetites. Similar findings have been reported by others, in which the free meal consisted of bakery products, fresh fruits, eggs, cheese, coffee and/or tea [147,148]. Two studies also

reported inclusion of vegetables in the soup kitchen meal [65,149]. Moreover, clients of food emergency programs including shelters, food pantries and soup kitchens reported a lack of consideration of food preferences [150], such as desiring more fruits, vegetables, and diabetic and cultural foods [151,152]. Nonetheless, the various types of foods offered at soup kitchens modestly improved the diet quality of its clients.

Although the meal of the soup kitchen was not substantial in size, it added more than half of the portions of refined and whole grains, fruits, dairy foods and meat (i.e.; egg) to the total diet of the participants. The total food intake of the soup kitchen clients met the 2015 U.S. Dietary Guidelines for grains, refined grains, fruits and protein foods; however, the total diet was still lacking in whole grains, vegetables and dairy foods [64]. The low levels of these foods in their original diet might be due to the high prices of vegetables and dairy foods as low-income populations may lack the financial resources to purchase these types of foods [49].

In Minnesota, Smith et al.[142] reported that the 254 homeless women consumed quantities that were less than the recommended for grains (5.4 vs. 6 servings), fruits (0.7 vs. 2 servings), vegetables (2.1 vs. 2.5 servings), milk (1.2 vs. 2 servings) and meat (2 vs. 2.5 servings), respectively. All of these portions are less than the quantities found in our sample, with the exception of vegetables and dairy foods. Similarly, Martins et al. showed that the 197 homeless using shelters in Rhode Island did not meet the dietary guidelines for fruits, dairy and meat/beans ($\leq$ 2.2 servings/day) [133]; these values are less than the amounts consumed by our sample.

The overall diet quality of our participants was modest (mean HEI-2010 = 61), despite the consumption of the donated meal. The moderate score was due primarily to low amounts of whole grains, vegetables, seafood and plant proteins, as well as elevated intakes of fatty acids, empty calories and Na [64].

Nguyen et al. recently explored diet quality in a population of 8,333 low-income men and women (mean age 45.5 years) that included SNAP recipients (27.3%). The diet quality of their diets was even lower than that found in the present study (HEI 2010 score = 45.4 vs. 55, respectively) [67]. Yet other studies conducted in the low-income in Texas by the author [153] and in Canada [154] reported findings that are similar to our outcomes. For instance, Shah et al. [153] found that diet quality was modest (mean HEI-2005 = 51.4) in 125, multi-ethnic, low-income post-partum women receiving WIC and SNAP benefits. Huet et al. [154] also reported that diet quality of 1901 low-income Inuit families was similar (HEI 2010 ≈ 54) to that of our sample ($\bar{x}$ HEI-2010 = 55).

The meal donation of the soup kitchen added to the total diet more than 50% of the DRIs of P and Cu, yet < 30% of vitamins C and B_{12}, folate and Mn [66,117]. In 2013, Lyles et al. [147] examined 22 meals of soup kitchens in San Francisco. Quantities of dietary fiber, Ca, K and vitamins A and E were lower than the DRIs by 77% - 93%[66,117,121]. These levels are similar to our results, except that our meal provided larger amounts of dietary fiber (7.1 vs. 13.3 g, respectively); presumably due to the incorporation of a whole-wheat bagel and large piece of fruit.

A nutritional analysis of three soup kitchens in Michigan also determined that the offered meal provided lower amounts than the recommended intakes [66,117,121] of energy, carbohydrates, protein, fat, vitamins A and C, B-vitamins, Mg, Fe, P, Zn, Ca, and Na [149]. But one would not expect a single meal to provide all the nutrients needed for one day.

In North Carolina, Eppich and Fernandez [155] documented that the meal served by a church supplemented the clients with about 1,149 - 1,244 kcal, 139 - 157 g carbohydrate, 36 - 54 g protein, 41 - 50 g fat, 98 - 142 µg folate, 46 - 54 mg, vitamin C, 569 - 1,244 µg vitamin A, 1 µg vitamin D, 300 - 411 mg Ca, 7 - 8 mg Fe, 2, and 2,113 - 3,939 mg Na. Nonetheless, these quantities were less than the reference intakes except for Fe and vitamin A [66,117,121]. In comparison to our results, quantities of energy (1,149 - 1,244 kcal/day 155; 999 kcal/day [149]), macro- and micronutrients of the meals reported by Sisson et al. [149] and Eppich and Fernandez [155] were greater than what we found (616 kcal/day).

In a study conducted in Manhattan of 69 men and women who attended the Flint Hills Breadbasket, total food intake was less than our findings and of the recommendations for dietary fiber (16 g) and folate (239 µg). But not for vitamin D (3.5 µg), Ca (831 mg) and Mg (285 mg) [66,117,156]. Similarly, Tse and Tarasuk [65] observed that the offered meal provided 1,136 kcal, 48 g protein, 10 g dietary fiber, 411 µg vitamin A, 99 mg vitamin C, 266 µg folate, 1 mg thiamin, 1 mg riboflavin, 22 mg niacin, 1 mg vitamin B_6, 3 µg vitamin B_{12}, 158 mg Mg, 8 mg Fe, 667 mg P, 7 mg Zn and 360 mg Ca. Compared with our meal, the nutrients in the meals observed by Tse and Tarasuk [65]

contained larger quantities of all nutrients except of fiber, which was greater in our research (10 vs. 13 g, respectively).

The differing results could be due to variations in the characteristics of the participants and meals, as well as methods of diet assessment. For example, most studies used 24-hour dietary recalls to estimate dietary intake in contrast to our use of a FFQ that incorporated foods consumed over a month.

Limitations of this research may include measurement error from the instrument (FFQ) [131,138], under- or over-estimation of the amount of the meal that the client received, and the use of self-reported weights and heights. However, the utilization of visual aids to estimate and report the portion size consumed, and a smart phone to document the offered meal, were strengths of this research.

Conclusions

According to our knowledge, this is the first study that measured diet quality of clients of a soup kitchen by the HEI. Although the meal itself was modest in size, the diet quality of the total diet was increased by 10% with the addition of a soup kitchen meal. Total daily dietary consumption of the participants met the recommendations for most food groups, with the exception of whole grains, vegetables and dairy foods. The addition of a citrus fruit and green leafy vegetables would greatly increase the intake of nutrients lacking including, Mn, folate and vitamin C. Yet, it is recognized that the addition of

these types of food may be the constrained by budget and limited storage facilities. Health professionals should be cognizant of these soup kitchens for their impact on improving nutritional status of the low-income and homeless in their communities.

CHAPTER 6. DISCUSSION AND CONCLUSIONS

Discussion

This research found that the charitable agencies from eight Southwestern states in the U.S. were highly involved in food rescue nutrition. Each month, these organizations provided a maximum of 254 million kg (~ 600 million lb) of food and serve a total of about 1.6 million clients. We also observed that the quantity of food donations provided to more than 12,000 low-income individuals in Texas was 207,657 kg (457,805 lb). These figures are lower than those offered by three food banks in California (~25 million lb), two food banks in Arizona (~10 million lb), two food banks in New York (4.4 million lb), and two food banks in Michigan (~ 4.4 million lb) [70]. The present study also indicated that 40% of the organizations in Texas are religious based, which is less than half that found in Mississippi and Alabama [75] and Canada [72]. Yet our findings that volunteers are a major component of the process of food redistribution is in agreement with the outcomes of Tarasuk et al. [72] and Eisinger et al. [76].

In addition to offering foods and/or meals, organizations involved in food rescue nutrition provided shelter, clothing, clinical and childcare as well to the clients. These agencies also served all individuals, irrespective of age, gender and ethnicity. Similar results are reported by Will and Miligan [77], Martínez [157], and Companion [74].

The organizations involved in food rescue nutrition reported challenges such as shortage of volunteers and resources. These barriers had adverse consequences on the

sustainability of food redistribution to the low-income, including discarding unsafe foods, minimizing the portions of donations, and/or turning away clients. The same issues that reduced food direction to those in need have been reported by several studies [78-81]. Directors of agencies that participated in our research suggested that solutions to maintain the continuity of operations of food rescue nutrition were increased availability of funding, food supplies, vehicles for food transportation, and food storage facilities.

The present investigation also developed and validated the Motivations to Volunteer Scale which assessed why people choose to volunteer. We found that the volunteers were highly motivated to participate in food rescue nutrition, as 58% scored above 10 on the Motivations to Volunteer scale. Individuals became involved in food rescue nutrition due to feelings of altruism, improving their career, broadening their social life, and/or being obliged to fulfill a school requirement or court order.

Altruism as a motive was prevalent in 29% of our sample, and increased the likelihood of volunteerism by about 2 fold ($P < 0.001$). In the U.S. and Croatia, altruism has been reported to increase the probability of involvement in community service by about 2 [97] and 0.5 fold [98] ($P < 0.05$), respectively. Professional development also was a major reason for the current participants (27.5%), which increased by 27.6, 1 and 1.3 fold if the individual was required to volunteer, would improve one's social network, and had feelings of altruism, respectively ($P < 0.05$). Findings of Heidrich [100], Handy et al.[101] and Clary et al.[95] observed comparable outcomes. These studies suggest that future career

options might be broadened by volunteering, yet these authors did not report the number of participants involved in this service.

Furthermore, less than one third of our sample reported that expansion of one's social life increased their probability to volunteer. This likelihood of volunteerism increased by 1.5, 0.7 and -0.14 fold if it was combined with not being obliged to be involved, being altruistic and improving career, respectively ($P < 0.001$). In 2008, Prouteau and Wolff [102] found that motivations to volunteer were correlated with meeting friends at the agency where they volunteer ($r = 0.44$, $P < 0.01$). Similarly, Yanagisawa and Sakakibara[103] observed that broadening one's social network enhanced the probability by of volunteering by about 4 fold ($P < 0.05$). Moreover, 16% of the present population volunteered because they were required to do so, yet they were motivated by developing their profession and resume by 1.5 fold ($P < 0.001$). A survey conducted in the U.S. by Stukas et al. [48] agrees with our outcomes. Authors determined that individuals who were required to do a community service were less likely to volunteer in the future than those who did it without restraint.

In our study, engagement in food rescue nutrition was greater in volunteers who were non-smokers, physically inactive, and attained a university/college degree as compared to smokers, and these who were active or were graduate students ($P < 0.05$). Similar positive associations also were indicated by Forbes and Zampelli [105] and Matsuba et al. [84]. The former study reported that volunteers who had a higher level of education were more likely to participate in public service by 23% [105] and 8% [84].

The frequency of volunteerism was more prevalent in our participants who attended an organization that was affiliated with a church, soup kitchen or food pantry than these who volunteered at an agency that was private or offered non-food items to clients. Our research also found that volunteers assisted in sorting donations, serving donations, preparing meals and childcare. These services are similar to that reported by Will and Miligan [77], as well as Tarasuk and Eakin [110]. These included sorting food donations according to type and expiration date, discarding unsafe foods [110], childcare and carrying food bags for the clients [77].

The previous literature of questionnaires to discern volunteerism in general including the Furnham scale [86]; Bales Volunteerism-Activism scale [87]; the Helping Attitudes Scale [88]; Attitude Toward Helping Others Scale [89]; Helping Power Motivation Scale [90]; Charity Values Sale [91]; Philanthropy Scale [158]; and Volunteer Motivation Scale[93]. However, our newly developed Motivations to Volunteer Scale is the first valid instrument to identify intentions of individuals to volunteer in food redistribution to the low-income.

Regarding clients of our sample, the soup kitchen contained more men and individuals who were younger, single, Caucasians, lacked income and homeless when compared with those of the food pantry ($P < 0.05$). Several surveys conducted in Florida[77], New York [159], Virginia [27], Washington [160], and Canada [161] documented similar results. In contrast, more than two thirds of the participants of Florida [77], Virginia [27] and Washington[160] were women, and 76% of those from New York were African

Americans[159]. Thus, soup kitchen attendees are considered to be more poverty-stricken than those of a food pantry; yet, both samples encountered similar problems of inaccessibility to food.

The soup kitchen sample reported more pronounced smoking, drinking alcohol and suffering from a health problem such as hyper-lipidemia hypertension, type-2 diabetes, arthritis and depression than that of the food pantry ($P < 0.05$). In 2013 Okuyemi et al. [162] observed that 6.4% and 2.3% of 430 homeless smokers in Minnesota aged 44.4 years suffered from depression and stress, respectively, and 40.7% drank 7 or more alcoholic drinks within 2 weeks. Mojtabai [163] also determined that 55.4% of 2,974 homeless adults (≥ 17 years), half of which had a mental disorder, engaged in alcohol and/or substance abuse. A similar investigation found that 87% of soup kitchen clients (mean age is 41 years) engaged in alcohol and/or drug abuse [164]. The authors [163,164] concluded that engaging in these health-risk behaviors could increase the probability of their low-income clients to become food insecure.

In the food pantry project, we observed that the food donations supplemented the total dietary intake of clients with additional amounts of energy, carbohydrates, protein, fat, dietary fiber, vitamins and minerals. Yet, the overall diet remained inadequate in fat-soluble vitamins, folate, Ca, Mg and K (< 30% of DRI) [66,117], even with the intake of the donation. Thus, despite free food donations, the nutritional status of clients of food pantries might be compromised.

In 2011, Jessri et al. [60] analyzed dietary content of food baskets of a food bank of the University of Alberta, Canada. The baskets provided each recipient with a daily amount of 3,251 kcal, 576 g carbohydrate, 156.9 g protein, 39 g fat, 61 g dietary fiber, 626 µg folate, 149 mg vitamin C, 802 µg vitamin A, 1,678 mg Ca, 40 mg Fe, and 9 mg Zn. Willows and Au [125] also assessed the nutrients of the donations of the University of Alberta Campus Food Bank in 2003. The foods provided each client with 3,062 kcal, 559 g carbohydrate, 139 g protein, 29 g fat, 7 g dietary fiber, 580 µg folate, 141 mg vitamin C, 728 µg vitamin A, 1,545 mg Ca, 31 mg Fe, and 7 mg Zn [125]. Thus, the nutritional value of food benefits has remained approximately the same over time at this food bank. The exception was for dietary fiber which increased by 88.5%. This difference is presumably due to the amount of fresh fruits and vegetables in 2011 [60]; as compared to 2003 when the hamper did not include any fresh produce [125]. Moreover, the food benefit provided by Alberta Campus Food Bank [60] contained larger quantities than the DRI as well as compared to our study.

In the present research, the food donation provided by a food bank added > 50% of the daily needs of grains, fruits, vegetables, dairy products and meat to the overall food consumption of its clients. Nonetheless, the total intake of whole grains and dairy foods continued to be less than the dietary recommendations for Americans [64], despite the additional food. This may be attributed to that some food recipients who refused to take whole grains bakery products and/or milk, due to not liking it or lacking a functioning refrigerator, respectively.

In 2014, the food donations offered for each client by a food bank in Canada contained 14.5, 7.6, 3.8 and 3.1 servings of grains, fruits and vegetables, meat products, milk and dairy, respectively. These estimates met the Canadian dietary guidelines for all food groups, but exceeded the recommendations for grains [60]. These were greater than the portions provided by the donation of this research, except for meat. Similarly, 81%, 27%, 43% and 77% of 77 users of food pantries did not meet the Canadian Dietary Guidelines for daily intakes of grains (6.1 servings), fruits and vegetables (3.7 servings), dairy (1.4 servings) and meat products (2.3 servings) [127]. The previous values are lower than the estimates consumed by our sample, except for dairy foods, which are similar to that found in the current study.

Our investigation found that the meal of the soup kitchen supplemented the total diet of participants with more than half of the servings of refined and whole grains, fruits, dairy foods and meat (i.e.; egg). Moreover, the overall food consumption met the 2015 Dietary Guidelines for Americans for grains, fruits and protein foods, but remained low in whole grains, vegetables and dairy products [64]. Similarly, Martins et al. [133] and Smith et al.[142] found that homeless men and women consumed < 2.5 servings of grains, fruits, vegetables, dairy foods and meat, which were below the U.S. Dietary Guidelines (grains: 6 portions, fruits: 2 portions, vegetables: 2 portions, dairy foods: 2 portions, and meat: 2.5 portions) [64]. These values also were less than that the amounts eaten by our soup kitchen clients except for vegetables, which was greater than that consumed in this study.

Furthermore, total diet quality of the clients of the soup kitchen was modest (mean HEI-2010 = 61), regardless of the consumption of the donated meal [64]. Nguyen et al.[67] recently observed that the diet quality of low-income men and women, who participated in the 2003-2010 National Health and Nutrition Examination Survey, was low, as the HEI-2010 score averaged 45. This score is lower than the value that we found in Texas (= 61). However, other studies conducted in low-income populations in Texas [153] and Canada [154] observed values of diet quality that are similar to what we reported (> 51).

We also observed that the soup kitchen meal improved the total diet of the clients by adding > 50% of the DRIs for dietary fiber, vitamins D, Mg and Cu. This meal also added greater amounts of P and Cu (~ 70%) of the DRIs. However, the daily intake remained inadequate in vitamins C and B_{12}, folate and Mn (< 30% of DRIs) [66]. Similar to our findings, Lyles et al. [147], Sisson et al. [149], Tse and Tarasuk [65], and Eppich and Fernandez [155] reported that the nutrient content of meals of soup kitchens provided amounts that were less than the recommended [66].

Conclusions

According to our knowledge, this is the first research that examined the extent of involvement of organizations and volunteers in food rescue nutrition, and how this redistribution of food improves the nutritional status of clients of food pantries and soup

kitchens. The degree of participation of non-government community and religious agencies, as well as of volunteers in food rescue nutrition was relatively high in eight Southwestern states in the U.S. All the involved programs collected and redistributed surplus foods to assist the government in providing food to the impoverished. In addition, the Motivations to Volunteer Scale was found to be a valid tool to assess the reasons that motivate individuals to volunteer and involve in food rescue nutrition. This scale consisted of four factors: requirement, career improvement, social life, and altruism. These motivations were distributed equally among the volunteers. We found that volunteerism was more pronounced in women and individuals who were > 30 years and Hispanic, held a university degree, and had a higher income (≥ $48,000) as well. Involvement in food rescue nutrition also was greater if the agency was a faith-based, food pantry or soup kitchen.

This research observed that diet quality, as measured by the HEI-2010 of the meal of the soup kitchen, was modest. Yet this free meal improved diet quality of the total diet by a modest amount (10%). The daily food intake of the clients met Dietary Guidelines for Americans for most food groups, except for whole grains, vegetables and dairy foods. We conclude that the food donation given by the food pantry had a substantial effect on the nutritional status of its clients. This donated food supplemented the total diet of participants with additional amounts of energy, carbohydrates, protein and fat that exceeded the DRIs. The overall dietary intake of these clients also met the dietary recommendations for grains, vegetables, fruits and meat, but remained low in whole

grains and dairy products. This low intake of such groups was attributed to the refusal of the clients to take the free whole grain bakery products and/or milk.

It is suggested that incorporating other foods in the meal of the soup kitchen and donation of the food pantry such as citrus fruits, would have a significant impact on the nutritional status of the clients. Nonetheless, we understand that the agencies involved in food rescue nutrition might have budgetary constraints and/or limited storage facilities that may preclude their ability to add such foods. Nutrition education to emphasize the health benefits of whole grains and dairy foods might be beneficial if conducted on site.

In conclusion, community organizations, food outlets and grocery stores are encouraged to provide support for the agencies involved in food rescue nutrition through offering money and/or food. Moreover, individuals should volunteer to assist these charitable networks that redistribute food to those in need. Finally, health and primary-care professionals should be cognizant of the impact of food rescue nutrition in improving the nutritional status of low-income populations. Additional research is warranted to investigate methods that could promote satisfaction and continuous participation of volunteers in food rescue nutrition, and the effect of food donations on food security of the food recipients.

REFERENCES

1. The United States Department of Agricultutre. Americans trash about 1/3 of their food, worth $161bn – USDA. *The US Department of Agricultutre (USDA)*. April 10, 2014. http://rt.com/usa/us-food-waste-usda-618/.
2. Federal Register by the U.S. Department of Health and Human Services. Annual Update of the HHS Poverty Guidelines. *Federal Register, The Daily Journal of the United States Government*. January 25, 2016. https://www.federalregister.gov/articles/2016/01/25/2016-01450/annual-update-of-the-hhs-poverty-guidelines. Accessed July 14, 2016.
3. Coleman-Jensen A, Rabbitt M, Gregory C, Singh A. *Household Food Security in the United States in 2014, ERR-194*. Washington DC 2015.
4. Vijayaraghavan M JESHaFA. The association between housing instability, food insecurity, and diabetes self-efficacy in low-income adults. *J Health Care Poor Underserved.*. 2011;22:1279-1291.
5. Vandermeerscha T, Alvarengaa R, Ragaertb P, Dewulfa J. Environmental sustainability assessment of food waste valorization options. *Resour Conserv Recy*. 2014;87:57-64.
6. Bilska B, Wrzosek M, Kołozyn-Krajewska D, Krajewski K. Risk of food losses and potential of food recovery for social purposes. *Waste Manage*. 2016;52:269–77.

7. Schneider F. The evolution of food donation with respect to waste prevention. *Waste Manage*. 2013;33:755–63.

8. Buzby J, Wells H, Hyman J. *The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels*. Washington, DC 2014.

9. Garrone P, Marco Melacini M, Perego A. Opening the black box of food waste reduction. *Food Policy*. 2014;46:129-39.

10. O'Connor C. Quantification of food waste in the EU. Fourth OECD Food Chain. *Bio Intelligence Service*. June 20, 2013. http://www.oecd.org/site/agrfcn/Session%201_ClementineOConnor.pdf. Accessed June 23, 2016.

11. Gooch M, Felfel A, Marenick N. Food waste in canada. *Value Chain Management Center*. November 2010. http://vcm-international.com/wp-content/uploads/2013/04/Food-Waste-in-Canada-112410.pdf. Accessed August 3, 2016.

12. Mason L, Boyle T, Fyfe J, Smith T, Cordell D. National Food Waste Assessment: Final Report. *Australian Government. Department of Sustainability, Environment, Water, Population and Communities*. June 2011. https://www.environment.gov.au/system/files/resources/128a21f0-5f82-4a7d-

b49c-ed0d2f6630c7/files/food-waste.pdf. Accessed August 2016, 3.

13. Girotto F, Luca Alibardi L, Cossu R. Food waste generation and industrial uses: A review. *Waste Manage*. 2015;45:32-41.

14. Muriana C. Effectiveness of the food recovery at the retailing stage under shelf life uncertainty: An application to Italian food chains. *Waste Manage*. 2015;41:159-68.

15. Giuseppe A, Mario E,Cinzia M. Economic benefits from food recovery at the retail stage: An application to Italian food chain. *Waste Manage*. 2014;34:1306-16.

16. Gallardo A, Carlos M, Peris M, Colomer F. Methodology to design a municipal solid waste generation and composition map: A case study. *Waste Manage*. 2014;34:1920-31.

17. Halloran A, Clement J, Kornum N, Bucatariu C, Jakob Magid J. Addressing food waste reduction in Denmark. *Food Policy*. 2014;49:294-301.

18. Beretta C, Stoessel F, Baier Y, Stefanie Hellweg S. Quantifying food losses and the potential for reduction in Switzerland. *Waste Manage*. 2013;33:764-73.

19. Lebersorger S, Schneider F. Food loss rates at the food retail, influencing factors and reasons as a basis for waste prevention measures. *Waste Manage*. 2014;34:1911-19.

20. Thi N, Kumar G, Lin C. An overview of food waste management in developing countries: Current status and future perspective. *J Environ Manage*. 2015;157:220-9.

21. Tagtow A, Nguyen J, Johnson-Bailey D, Schap T. Food Waste Reduction Efforts at the USDA. *J Acad Nutr Diet*. 2015;115:1914-8.

22. US Environmental Protection Agency. Sustainable Management of Food. Food Recovery Hierarchy. March 31, 2016. Available at: https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy. Accessed June 24, 2016.

23. Papargyropoulou E, Lozano R, Steinberger J, Wright N. The food waste hierarchy as a framework for the management of food surplus and food waste. *J Clean Prod*. 2014;76:106-15.

24. Nutrition.gov - National Agricultural Library (USDA). Food assistance programs. May 7, 2014. Available at: http://www.nutrition.gov/food-assistance-programs. Accessed July 20, 2014.

25. Mabli J, Worthington J. Supplemental Nutrition Assistance Program participation and child food security. *Pediatrics*. 2014;133:610-9.

26. Dhokarh R, Himmelgreen DA, Peng YK, Segura-Pérez S, Hromi-Fiedler A, and Pérez-Escamilla R. Food insecurity is associated with acculturation and social networks in Puerto Rican households. *J Nutr Educ Behav*. 2011;43:288-

294.

27. Biggerstaff M, Morris P, Nichols-Casebolt A. Living on the edge: examination of people attending food pantries and soup kitchens. *Soc Work*. 2002;47:267-77.

28. Jacknowitz A, Morrissey T, Brannegan A. Food insecurity across the first five years: Triggers of onset and exit. *Child Youth Serv Rev*. 2015;53:24-33.

29. Handforth B, Hennink M, Schwartz M. A qualitative study of nutrition-based initiatives at selected food banks in the feeding America network. *J Acad Nutr Diet*. 2013;113:411-5.

30. Tarasuk V, Dachner N, Loopstra R. Food banks, welfare, and food insecurity in Canada. *Brit Food J*. 2014;116:1405-17.

31. Tarasuk V, Dachner N, Hamelin A, Ostry A, Williams P, Bosckei E, Poland B, Raine K. A survey of food bank operations in five Canadian cities. *BMC Public Health*. 2014;14:1234-44.

32. Lindberg R, Whelan J, Lawrence M, Gold L, Friel S. Still serving hot soup? Two hundred years of a charitable food sector in Australia: a narrative review. *Aust N Z J Public Health*. 2015;39:358-65.

33. Lambie-Mumford H, Dowler E. Hunger, food charity and social policy – challenges faced by the emreging evidence base. *Soc Policy Soc*. 2015;14:497-506.

34. Neter J, Dijkstra S, Visser M, Brouwer I. Food insecurity among Dutch food bank recipients: A cross-sectional study. *BMJ*. 2014;4:e004657.

35. Silvasti T. Food Aid – Normalising the Abnormal in Finland. *Soc Poli Soc*. 2015;14:471-82.

36. Kim S. Exploring the endogenous governance model for alleviating food insecurity: Comparative analysis of food bank systems in Korea and the USA. *Int J Soc Welfare*. 2015;24:145-58.

37. McKeevr B. *The Nonprofit Sector in Brief 2015*. Washington, DC 2015.

38. Duffy P, Zizza C, Jacoby J, Tayie F. Diet quality is low among female food pantry clients in Eastern Alabama. *J Nutr Educ Behav*. 2009;41:414-9.

39. Feeding America. Feeding America. June 12, 2015. Available at: http://www.feedingamerica.org/about-us/about-feeding-america/annual-report/2015-feeding-america-annual.pdf. Accessed June 12, 2016.

40. Community Harvest of Stark County. Community Harvest of Stark County. June 3, 2014. Available at: http://www.communityharveststark.org/. Accessed June 3, 2014.

41. Office of the Chief Economist, USDA. Recovery Donations. *Office of the Chief Economist, the U.S. Department of Agriculture*. April 15, 2014. http://www.usda.gov/oce/foodwaste/resources/donations.htm.

42. Tielens J, Candel J. *Reducing food wastage, improving food security?*

Netherlands 2014.

43. Glanze K, Rimer B, Viswanath K. *Health behavior and health education*. San Francisco: Wiley imprint; 2008.

44. Wilson J. Volunteerism research: A review essay. *Nonprofit Volunt Sect Q*. 2012;41:176-212.

45. Gutierrez I, Mattis J. Factors predicting volunteer engagement among urban-residing African American women. *J Black Stud*. 2014;45:599-619.

46. Borgonovi F. Doing well by doing good. The relationship between formal volunteering and self-reported health and happiness. *Soc Sci Med*. 2008;66:2321-34.

47. Capital Area Food Bank of Texas. Capital Area Food Bank of Texas: A Fiscal Year 2012-13 Snapshot. September 1, 2014. Available at: http://www.austinfoodbank.org/about-us/. Accessed September 20, 2014.

48. Stukas A, Snyder M, Clary G. The Effects of "Mandatory Volunteerism" on Intentions to Volunteer. *Psychol Sci*. 1999;10:59-64.

49. Morrissey T, Jacknowitz A, and Vinopal K. Local food prices and their associations with children's weight and food security. *Pediatrics*. 2014;133:422-430.

50. Escaron A, Meinen A, Nitzke S, Martinez-Donate A. Supermarket and grocery store–based interventions to promote healthful food choices and

eating practices: A systematic review. *Prev Chronic Dis*. 2013;10:1-20.

51. Leung C, Cluggish S, Villamor E, Catalano P, Willett W, and Rimm E. Few changes in food security and dietary intake from short-term participation in the Supplemental Nutrition Assistance Program among low-income Massachusetts adults. *J Nutr Educ Behav*. 2014;46:68-74.

52. Dammann K, Smith C. Factors affecting low-income women's food choices and the perceived impact of dietary intake and socioeconomic status on their health and weight. *J Nutr Educ Behav*. 2009;41:242-53.

53. High Level Panel of Experts on Food Security and Nutrition. Price volatility and food security. *Committee on World Food Security; Food and Agriculture Organization (FAO)*. July 2011. http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE-price-volatility-and-food-security-report-July-2011.pdf. Accessed June 12, 2014.

54. Walker R, Block J, and Kawachi I. Do residents of food deserts express different food buying preferences compared to residents of food oases? A mixed-methods analysis. *Int J Behav Nutr Phys Act*. 2012;9:41-53.

55. Kohn M, Bell J, Grow H, and Chan G. Food insecurity, food assistance and weight status in US youth: new evidence from NHANES 2007–08. *Pediatrics Obesity*. 2013;9:155-166.

56. Dammann K, Smith C. Race, homelessness, and other environmental factors

associated with the food-purchasing behavior of low-income women. *J Am Diet Assoc.* 2010;110:1451-1356.

57. Cahill J, Freeland-Graves JH, Shah BS, Lu H. Motivations to eat are related to diet quality and food intake in overweight and obese, low-income women in early postpartum. *Appetite*. 2010;55:263-70.

58. Dixon L, Winkleby M, Radimer K. Dietary intakes and serum nutrients differ between adults from food-insufficient and food-sufficient families: Third National Health and Nutrition Examination Survey, 1988-1994. *J Nutr.* 2001;131:1232-46.

59. Champagne C, Casey P, Connell C, Stuff J, Gossett J, Harsha D, McCabe-Sellers B, Robbins J, Simpson P, Weber J, Bogle M. Poverty and food intake in rural America: diet quality is lower in food insecure adults in the Mississippi Delta. *J Am Diet Assoc.* 2007;107:1886-94.

60. Jessri M, Abedi A, Wong A, Eslamian G. Nutritional quality and price of food hampers distributed by a campus food bank: a Canadian experience. *J Health Popul Nutr*. 2014;32:287-300.

61. Nackers L, Appelhans B. Food insecurity is linked to a food environment promoting obesity in households with children. *J Nutr Educ Behav*. 2013;45:780-784.

62. Acheampong I, Haldeman L. Are nutrition knowledge, attitudes, and beliefs

associated with obesity among low-income Hispanic and African American women caretakers? *J Obes*. 2013;2013:1-8.

63. Kirkpatrick S, Tarasuk V. Food insecurity is associated with nutrient inadequacies among Canadian adults and adolescents. *J Nutr*. 2008;138:604-12.

64. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Dietary Guidelines for Americans 2015-2020. December 2015. http://health.gov/dietaryguidelines/2015/guidelines/. Accessed July 1, 2016.

65. Tse C, Tarasuk V. Nutritional assessment of charitable meal programmes serving homeless people in Toronto. *Public Health Nutr*. 2008;11:1296-305.

66. Institute of Medicine (IOM) of the National Academies of Science. Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc. *Institute of Medicine (IOM) of the National Academies of Science*. 2001. http://www.iom.edu/Reports/2001/Dietary-Reference-Intakes-for-Vitamin-A-Vitamin-K-Arsenic-Boron-Chromium-Copper-Iodine-Iron-Manganese-Molybdenum-Nickel-Silicon-Vanadium-and-Zinc.aspx. Accessed February 1st, 2014.

67. Nguyen B, Shuval K, Bertmann F, Yaroch A. The Supplemental Nutrition

Assistance Program, food insecurity, dietary quality, and obesity among U.S. adults. *Am J Public Health*. 2015;105:1453-9.

68. Coleman-Jensen A, Rabbitt M, Gregory C, Singh A. *Statistical Supplement to Household Food Security in the United States in 2015, ERR-215*. Washington DC 2016.

69. Texas Constitution and Statutes. Civil Practice and Remedies Code. Title 4. Liability in Tort. Chapter 76. Food Donors. June 16, 2015. http://www.statutes.legis.state.tx.us/Docs/CP/htm/CP.76.htm. Accessed August 1, 2016.

70. Vitiello D, Grisso J, Whiteside L, Fischman R. From commodity surplus to food justice: food banks and local agriculture in the United States. *Agric Hum Values*. 2015;32:419–30.

71. Capital Area Food Bank of Texas. Capital Area Food Bank of Texas: Annual Report 2014-2015. June 25, 2016. Available at: https://www.capitalareafoodbank.org/programs/food-waste/. Accessed June 25, 2016.

72. Tarasuk V, Dachner N, Hamelin A, Ostry A, Williams P, Bosckei E, Poland B, Raine K. A survey of food bank operations in five Canadian Cities. *BMC Public Health*. 2014;14:1234-44.

73. Neter J, Dijkstra S, Visser M, Brouwer I. Dutch food bank parcels do not meet

nutritional guidelines for a healthy diet. *Br J Nutr*. 2016;116:526-33.

74. Companion M. Constriction in the variety of urban food pantry donations by private individuals. *J Urban Aff*. 2010;32:633-46.

75. Cashwell S, Bartkowski J, Duffy P, Casanova V, Molnar J, Irima-Vladu M. Private food assistance in the deep south: Assessing agency directors' knowledge of charitable choice. *JSSW*. 2004;31:157-77.

76. Eisinger P. Organizational capacity and organizational effectiveness among street-level food assistance programs. *Nonprofit Volunt Sect Q*. 2002;31:115-30.

77. Will J, Milligan T. Toward an understanding of food pantry food recipients and the agencies that serve them. *J Appl Soc Sci*. 2015;9:65-74.

78. Phillips C, Hoenigman R, Higbee B, Reed T. Understanding the sustainability of retail food recovery. *PLoS One*. 2013;8:e75530-8.

79. Warshawsky D. New power relations served here: The growth of food banking in Chicago. *Geoforum*. 2010;41:763–75.

80. Bishop S. Building a profile of Missouri CSBG community action agencies: Capacities, coping strategies, and the new public management. *Nonprofit Manag Leadersh*. 2004;15:71-93.

81. Tarasuk V, Eakin J. Charitable food assistance as symbolic gesture: an ethnographic study of food banks in Ontario. *Soc Sci Med*. 2003;56:1505-15.

82. Mclintyre L, Dayle J. Exploratory analysis of children's nutrition programs in Canada. *Soc Sci Med*. 1992;35:1123-9.

83. Davis L, Sengul I, Ivy J, Brock L, Miles L. Scheduling food bank collections and deliveries to ensure food safety and improve access. *Socioecon Plann Sci*. 2014;48:175-88.

84. Matsuba M, Glanville NT, Raine KD, Dayle JB, Anderson B, Battaglia N. Psychological and social-structural infuences on commitment to volunteering. *J Res Pers*. 2007;41:889-907.

85. Nesbit R. The influence of major life cycle events on volunteering. *Nonprofit Volunt Sect Q*. 2012;41:1153-74.

86. Furnham A. The just world, charitable giving, and attitudes to disability. *Pers Individ Dif*. 1995;19:577-83.

87. Bales K. Measuring the propensity to volunteer. *Soc Policy Admin*. 1996;30:206-26.

88. Nickell G. The Helping Attitudes Scale. Paper presented at 106th Convention of the American Psychological Association at San Francisco, 1998; San Francisco.

89. Webb D, Green C, Brashear T. Development and validation of scales to measure attitudes influencing monetary donations to charitable organizations. *J Acad Market*. 2000;28:299-309.

90. Frieze I, Boneva B. Power motivation and motivation to help others. *The Use and Abuse of Power*. MI: Ann Arbor, Sheridan Books; 2001.

91. Bennett R. Factors underlying the inclination to donate to particular types of charity. *Int J Nonprofit Volunt Sect Mark*. 2003;8:12-29.

92. Schuyt T, Smit J, Bekkers R. Constructing a Philanthropy Scale: Social Responsibility and Philanthropy. Paper Presented at the 33d ARNOVA Conference, 2004; Los Angeles.

93. Bang H, Ross S. Volunteer motivation and satisfaction. *J Venue Event Manag*. 2009;1:61–77.

94. Klohe-Lehman D, Freeland-Graves JH, Anderson E, McDowell T, Clarke K, Hanss-Nuss H, Cai G, Puri D, Milani T. Nutrition knowledge is associated with greater weight loss in obese and overweight low-income mothers. *J Am Diet Assoc*. 2007;106:65–75.

95. Clary E, Snyder M, Ridge R, Copeland J, Stukas A, Haugen J, Miene P. Understanding and assessing the motivations of volunteers: a functional approach. *J Pers Soc Psychol*. 1998;74:1516-30.

96. Tabachnick B, Fidell L. *Using Multivariate Analysis*. Boston: Pearson Education; 2013.

97. Ahn S, Phillips K, Smith M, Ory M. Correlates of volunteering among aging Texans: the roles of health indicators, spirituality, and social engagement.

Maturitas. 2011;69:257-62.

98. Miljkovic D, Rijavec M, Jurcec L. Who Volunteers, Why and with What Consequences? Life Aspirations, Motives and Outcomes of Volunteering and Well-Being. *Identities and Citizenship Education: Controversy, Crisis and Challenges*. London: Children's Identity & Citizenship in Europe (CiCe); 2013.

99. De Wit A, Bekkers R. Exploring gender differences in charitable giving: The Dutch case. *Nonprofit Volunt Sect Q*. 2015;44:1-21.

100. Heidrich K. Volunteers' life-styles: Market segmentation based on volunteers' role choices. *Nonprofit Volunt Sect Q*. 2012;19:21-31.

101. Handy F, Cnaan R, Hustinx L, Kang C, Brudney J, Haski-Leventhal D, Holmes K, Meijs L, Pessi A, Ranade B, Yamauchi N, Zrinscak, S. A cross-cultural examination of student volunteering: Is it all about resume building? *Nonprofit Volunt Sect Q*. 2010;39:498-523.

102. Prouteau L, Wolff F. On the relational motive for volunteer work. *J Econ Psychol*. 2008;29:314–35.

103. Yanagisawa H, Sakakibara H. Factors affecting satisfaction levels of Japanese volunteers in meal delivery services for the elderly. *Public Health Nurs*. 2008;25:471-9.

104. Tarasuk, Eakin J. Food assistance through ‘‘surplus’’ food: Insights from an

ethnographic study of food bank work. *Agric Human Values*. 2005;22:177–86.

105. Forbes K ZE. Volunteerism: The influences of social, religious, and human capital. *Nonprofit Volunt Sect Q*. 2014;43:227-53.

106. Willigen M. Differential benefits of volunteering across the life course. *J Gerontol*. 2000;55B:S308-18.

107. Lancee B, Radl J. Volunteering over the life course. *Soc Forces*. 2014;93:833-62.

108. Jirovec R, Hyduk C. Type of volunteer experience and health among older adult volunteers. *J Gerontol Soc Work*. 1998;30:29-42.

109. Einolf C. Gender differences in the correlates of volunteering and charitable giving. *Nonprofit Volunt Sect Q*. 2010;40:1092-112.

110. Tarasuk V, Eakin J. Food assistance through ‘‘surplus’’ food: Insights from an ethnographic study of food bank work. *Agric Human Values*. 2005;22:177–86.

111. Donate Don't Dump. Donate Don't Dump. 2013. Available at: http://donatedontdump.net/. Accessed April 10, 2014.

112. We Don't Waste. We Don't Waste. 2012. Available at: http://www.wedontwaste.org/. Accessed April 12, 2014.

113. The Campus Kitchen Project. The Campus Kitchen Project. Student-Powered Hunger Relief. 2016. Available at: http://www.campuskitchens.org/mission/. Accessed August 1, 2016.

114. Capital Area Food Bank of Texas. Capital Area Food Bank of Texas. Annual Report 2013-2014. January 1, 2016. Available at: http://www.austinfoodbank.org/about-us/. Accessed July 1, 2016.

115. Daponte B , Lewis G, Sanders S, Taylor L. Food pantry use among low-income households in Allegheny county, Pennsylvania. *J Nutr Edu*. 1998;30:50-57.

116. Holben D. Food bank users in and around the lower mainland of British Columbia, Canada, are characterized by food insecurity and poor produce intake. *J Hunger Environ Nutr*. 2012;7:449-58.

117. Institute of Medicine (IOM) of the National Academies of Science. Institute of Medicine (IOM) of the National Academies of Science. 2001. https://www.nap.edu/catalog/6015/dietary-reference-intakes-for-thiamin-riboflavin-niacin-vitamin-b6-folate-vitamin-b12-pantothenic-acid-biotin-and-choline. Accessed September 10, 2015.

118. McIntyre L, Glanville NT, Raine KD, Dayle JB, Anderson B, Battaglia N. Do low-income lone mothers compromise their nutrition to feed their children? *CMAJ*. 2003;168:686-91.

119. George G, Milani T, Hanss-Nuss H, Kim M, and Freeland-Graves J. Development and validation of a semi-quantitative food frequency questionnaire for young adult women in the southwestern United States. *Nutr*

Res. 2004;24:29-43.

120. FoodWorks. Epi Info. Version 17

121. Institute of Medicine (IOM) of the National Academies of Science. Institute of Medicine (IOM) of the National Academies of Science. 2001. http://www.nationalacademies.org/hmd/Activities/Nutrition/SummaryDRIs/DRI-Tables.aspx. Accessed September 10, 2015.

122. Choose MyPlate. http://www.choosemyplate.gov/. June 2, 2011. Accessed June 16, 2014.

123. Akobundu U, Cohen N, Laus M, Schulte M, Soussloff M. Vitamins A and C, calcium, fruit, and dairy products are limited in food pantries. *J Acad Nutr Diet*. 2004;104:811-3.

124. Greger J, Maly A, Jensen N, Kuhn J, Monson K, Stocks A. Food pantries can provide nutritionally adequate food packets but need help to become effective referral units for public assistance programs. *J Acad Nutr Diet*. 2002;102:1126-8.

125. Willows N, Au V. Nutritional quality and price of university food bank hampers. *Can J Diet Pract Res*. 2006;67:104-7.

126. Irwin J, Ng V, Rush T, Nguyen C, He M. Can food banks sustain nutrient requirements? A case study in Southwestern Ontario. *Cana Public Health Assoc*. 2007;98:17-20.

127. Rush T, Ng V, Irwin J, Stitt L, He M. Food insecurity and dietary intake of immigrant food bank users. *Can J Diet Pract Res*. 2007;68:73-8.

128. Jacobs-Starkey L, Kuhnlein H. Monteral food bank users' intakes compared with recommendations of Canada's Food Guide to Healthy Eating. *Can J Diet Pract Res*. 2000;61:73-5.

129. Starkey L, Gray-Donald K, Kuhnlein H. Nutrient intake of food bank users is related to frequency of food bank use, household size, smoking, education and country of birth. *J Nutr*. 1999;129:883-9.

130. Teron A, Tarasuk V. Charitable food assistance: what are food bank users receiving? *Can J Public Health*. 1999;90:382-4.

131. Depa J, Hilzendegen C, Tinnemann P, Stroebele-Benschop N. An explorative cross-sectional study. *Int J Equity Health*. 2015;14:141-50.

132. Preston H, Burley J. What's in a food bag? Analysis of the content of food bags provided by the Bradford Metropolitan Food Bank. *P Nutr Soc*. 2015:E136.

133. Martins D, Gorman K, Miller R, Murphy L, Sor S, Martins J, Vecchiarelli M. Assessment of food intake, obesity, and health risk among the homeless in Rhode Island. *Public Health Nurs*. 2015;32:453-61.

134. Gany F, Bari S, Crist M, Moran A, Rastogi N, Leng J. Food insecurity: limitations of emergency food resources for our patients. *J Urban Health*.

2013;90:552-8.

135. Martin K, Wu R, Wolff M, Colantonio AG, Grady J. A novel food pantry program: food security, self-sufficiency, and diet-quality outcomes. *Am J Prev Med*. 2013;45:569-75.

136. Miewald C, Holben D, Hall P. Role of a food box program in fruit and vegetable consumption and food security. *Can J Diet Pract Res*. 2012;73:59-65.

137. Hoisington A, Manore MM, Raab C. Nutritional quality of emergency foods. *J Acad Nutr Diet*. 2011;111:573-6.

138. Kirkpatrick S, Reedy J, Butler E, Dodd K, Subar A, Thompson F, McKinnon R. Dietary assessment in food environment research: a systematic review. *Am J Prev Med*. 2014;46:94-102.

139. Subar A. Developing dietary assessment tools. *J Am Diet Assoc*. 2004;104:769-70.

140. DeNavas-Walt C, Proctor B. *Income and Poverty in the United States: 2014*. Wahington, DC 2015.

141. Campbell C, Hudson H, Webb K, Crawford P. The development of a surveillance system to monitor emergency food relief in New York State. *Am J Public Health*. 1987;77:1350-1.

142. Smith C, Butterfass J, Richards R. Environment influences food access and

resulting shopping and dietary behaviors among homeless Minnesotans living in food deserts. *Agric Hum Values*. 2010;27:141-61.

143. Lenhart N, Read M. Demographic profile and nutrient intake assessment of individuals using emergency food programs. *J Am Diet Assoc*. 1989;89:1269-72.

144. Guenther P, Casavale K, Reedy J, Kirkpatrick S, Hiza H, Kuczynski K, Kahle LL, Krebs-Smith S. Update of the Healthy Eating Index: HEI-2010. *J Acad Nutr Diet*. 2013;113:569-80.

145. Guenther P, Kirkpatrick S, Reedy J, Krebs-Smith S, Buckman D, Dodd K, Casavale K, Carroll R. The Healthy Eating Index-2010 Is a valid and reliable measure of diet quality according to the 2010 Dietary Guidelines for Americans. *J Nutr*. 2014;144:399-407.

146. Food and Nutrition Services. United States Department of Agriculture (USDA). Supplemental Nutrition Assistance Program (SNAP) - Eligibility. October 20, 2016. http://www.fns.usda.gov/snap/eligibility. Accessed December 3, 2016.

147. Lyles C, Drago-Ferguso S, Lopez A, Seligman H. Nutritional assessment of free meal programs in San Francisco. *Prev Chronic Dis*. 2013;10:1-4.

148. Keller-Olaman S, Edwards V, Elliott S. Evaluating a food bank recipe-tasting program. *Can J Diet Pract Res*. 2005;66:183-6.

149. Sisson L, Lown D. Do soup kitchen meals contribute to suboptimal nutrient intake and obesity in the homeless population. *Grand Valley State University, Scholar Works@GVSU*. 2011. http://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1000&context=htm_articles. Accessed June 15, 2016.

150. Campbell E, Hudson H, Webb K, Crawford P. Food preferences of users of the emergency food system. *J Hunger Environ Nutr*. 2011;6:179-87.

151. Azurdia A, Lecompte E, Sibbald E. Bon appétit! a process evaluation of a campus-based food bank. *J Hunger Environ Nutr*. 2011;6:324-42.

152. Verpy H, Smith C, Reicks, M. Attitudes and behaviors of food donors and perceived needs and wants of food shelf clients. *J Nutr Edu Behav*. 2003;35:6-15.

153. Shah B, Freeland-Graves J, Cahill J, Lu H, Graves G. Diet quality as measured by the healthy eating index and the association with lipid profile in low-income women in early postpartum. *J Am Diet Assoc*. 2010;110:274-9.

154. Huet C, Rosol R, Egeland G. The prevalence of food insecurity is high and the diet quality poor in Inuit communities. *J Nutr*. 2012;142:541-7.

155. Eppich S, Fernandez C. Study finds Chapel Hill, NC, soup kitchen serves nutritious meals. *J Am Diet Assoc*. 2004;104:1284-6.

156. Bell M, Wilbur L, Smith C. Nutritional status of persons using a local

emergency food system program in middle America. *J Am Diet Assoc*. 1998;98:1031-3.

157. Martínez A. Reconsidering acculturation in dietary change research among Latino immigrants: challenging the preconditions of US migration. *Ethn Health*. 2013;18:115-35.

158. Schuyt T, Smit J, Bekkers R. Constructing a philanthropy scale: Social responsibility and philanthropy. Paper presented at the 33d ARNOVA conference, 2004; Los Angeles.

159. Bowering J, Clancy K, Poppendieck J. Characteristics of a random sample of emergency food program users in New York: II. Soup kitchens. *Am J Public Health*. 1991;81:914–7.

160. Hoisington A, Shultz J, Butkus S. Coping strategies and nutrition education needs among food pantry users. *J Nutr Educ Behav*. 2002;34:26-33.

161. Starkey L, Kuhnlein H, Gray-Donald K. Food bank users: Sociodemographic and nutritional characteristics. *CMAJ*. 1998;158:1143–9.

162. Okuyemi K, Goldade K, Whembolua G, Thomas J, Eischen S, Sewali B, Guo H, Connett J, Grant J, Ahluwalia J, Resnicow K, Owen G, Gelberg L, Des Jarlais D. Motivational interviewing to enhance nicotine patch treatment for smoking cessation among homeless smokers: a randomized controlled trial. *Addiction*. 2013;108:1136-44.

163. Mojtabai R. Perceived reasons for loss of housing and continued homelessness among homeless persons with mental illness. *Psychiatr Serv*. 2005;56:172-8.

164. Rosenblum A, Magura S, Kayman DJ, Fong C. Motivationally enhanced group counseling for substance users in a soup kitchen: a randomized clinical trial. *Drug Alcohol Depend*. 2005;80:91-103.

165. Iglesias-Rios L, Bromberg J, Moser R, Augustson E. Food insecurity, cigarette smoking, and acculturation among Latinos: data from NHANES 1999-2008. *J Immigr Minor Health*. 2015;17:349-57.